TC-850

General Export Model
GEP Model

ISO
Set using ISO screws

SPECIFICATIONS

Power Requirements: AC 100V, 110V, 117V, 125V, 220V, 240V 50/60 Hz, 110W

Track System:
TC-850-2: 2-track stereophonic, monophonic recording
2-track and 4-track stereophonic, monophonic playback
TC-850-4: 4-track stereophonic, monophonic recording
4-track and 2-track stereophonic, monophonic playback

Reel Size: 10½" (265 mm) or smaller

Tape Speed: 15 ips (38 cm/s), 7½ ips (19 cm/s), 3¾ ips (9.5 cm/s)

Recording Time: (with 2,427 ft or 740m tape)
2-track stereo, 2 hours at 3¾ ips (9.5 cm/s)
4-track stereo, 4 hours at 3¾ ips (9.5 cm/s)
2-track mono, 4 hours at 3¾ ips (9.5 cm/s)
4-track mono, 8 hours at 3¾ ips (9.5 cm/s)

Frequency Response: (with SONY Super Low-noise Hi-output tape)
20 ~ 30,000 Hz (30 ~ 25,000 Hz ±2 dB) at 15 ips (38 cm/s)
20 ~ 30,000 Hz (30 ~ 22,000 Hz ±2 dB) at 7½ ips (19 cm/s)
20 ~ 20,000 Hz (40 ~ 15,000 Hz ±2 dB) at 3¾ ips (9.5 cm/s)

(with standard tape)
20 ~ 28,000 Hz (30 ~ 20,000 Hz ±2 dB) at 15 ips (38 cm/s)
20 ~ 25,000 Hz (30 ~ 18,000 Hz ±2 dB) at 7½ ips (19 cm/s)
20 ~ 18,000 Hz (40 ~ 12,000 Hz ±2 dB) at 3¾ ips (9.5 cm/s)

Signal-to-Noise Ratio: 59 dB (with SONY SLH tape), 56 dB (with standard tape)

Flutter and Wow:
0.03% at 15 ips (38 cm/s)
0.04% at 7½ ips (19 cm/s)
0.08% at 3¾ ips (9.5 cm/s)

Recording Bias Frequency: Approx. 120 kHz

Inputs:
Two MIC inputs
Impedance: 600Ω
Maximum sensitivity: 0.2 mV (-72 dB)

Two LINE INPUTs
Impedance: 100 kΩ
Maximum sensitivity: 0.07 V (-22 dB)

Outputs:
Two LINE OUTPUTs
Impedance: 2.2 kΩ
Maximum sensitivity: 0.775 V (0 dB)

HEADPHONE output
Load impedance: 8Ω

Semiconductors: 77 transistors and 79 diodes

Dimensions: 17½ (W) x 19 11/16 (H) x 10" (D) (445 x 501 x 254.5 mm)

Weight: 57 lb 5 oz (26 kg)

SONY®
SERVICE MANUAL

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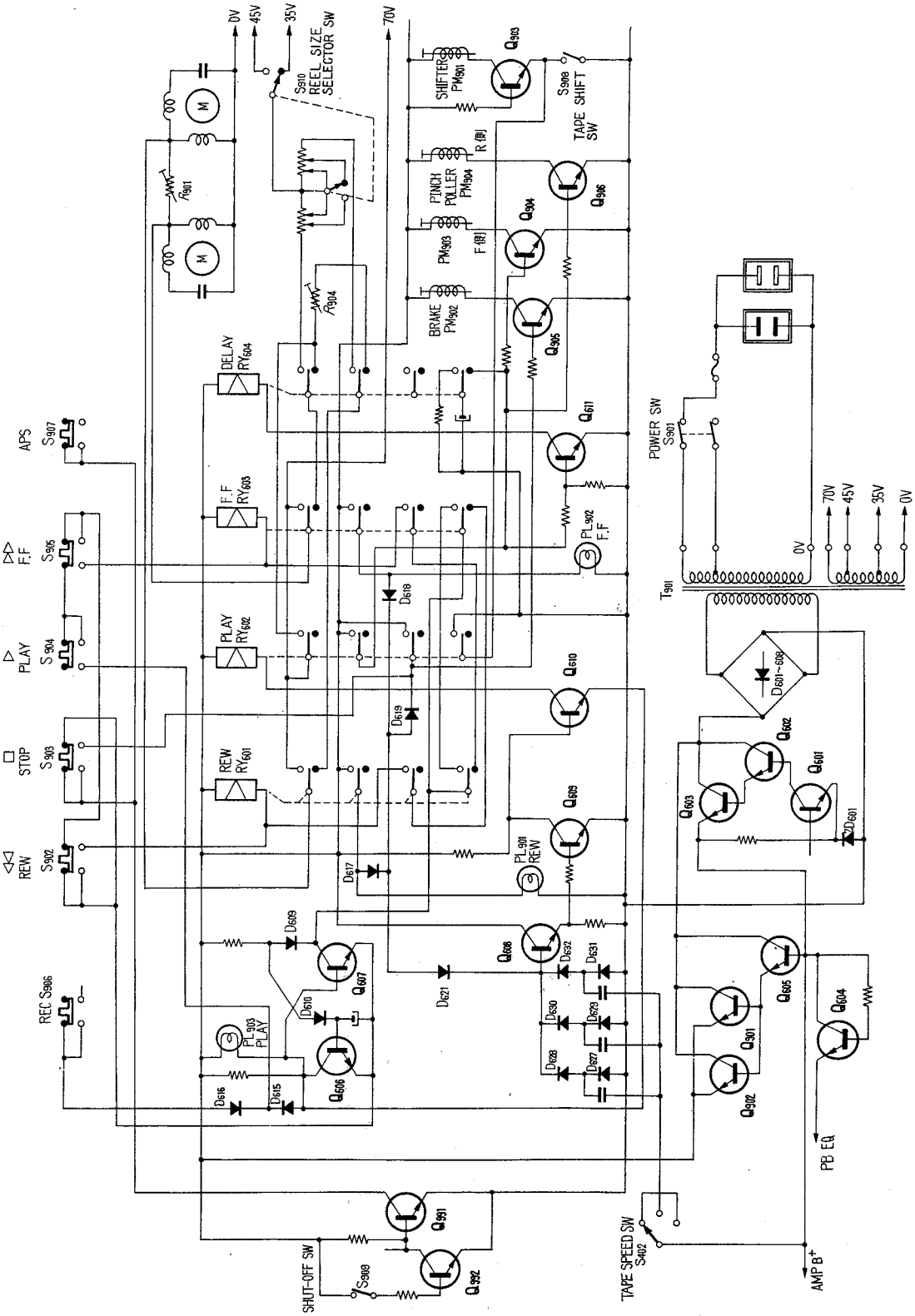
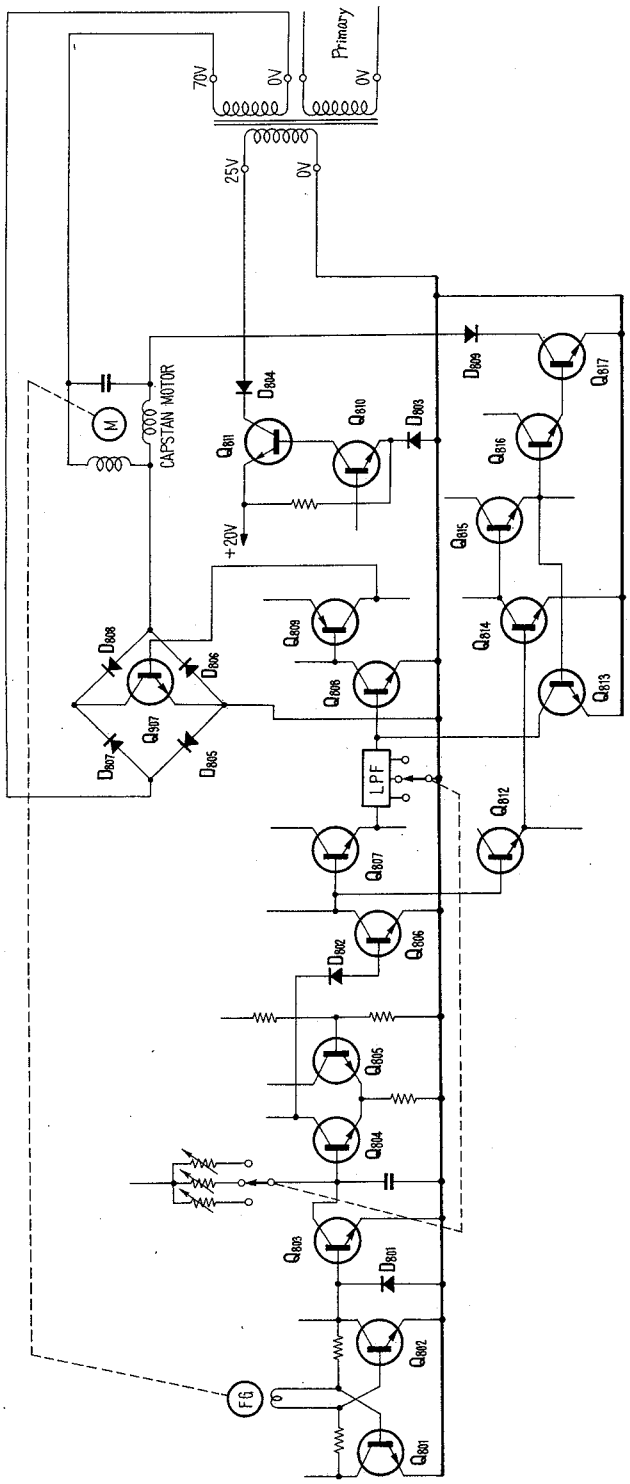
SECTION 1
GENERAL DESCRIPTION

1-1. BLOCK DIAGRAM

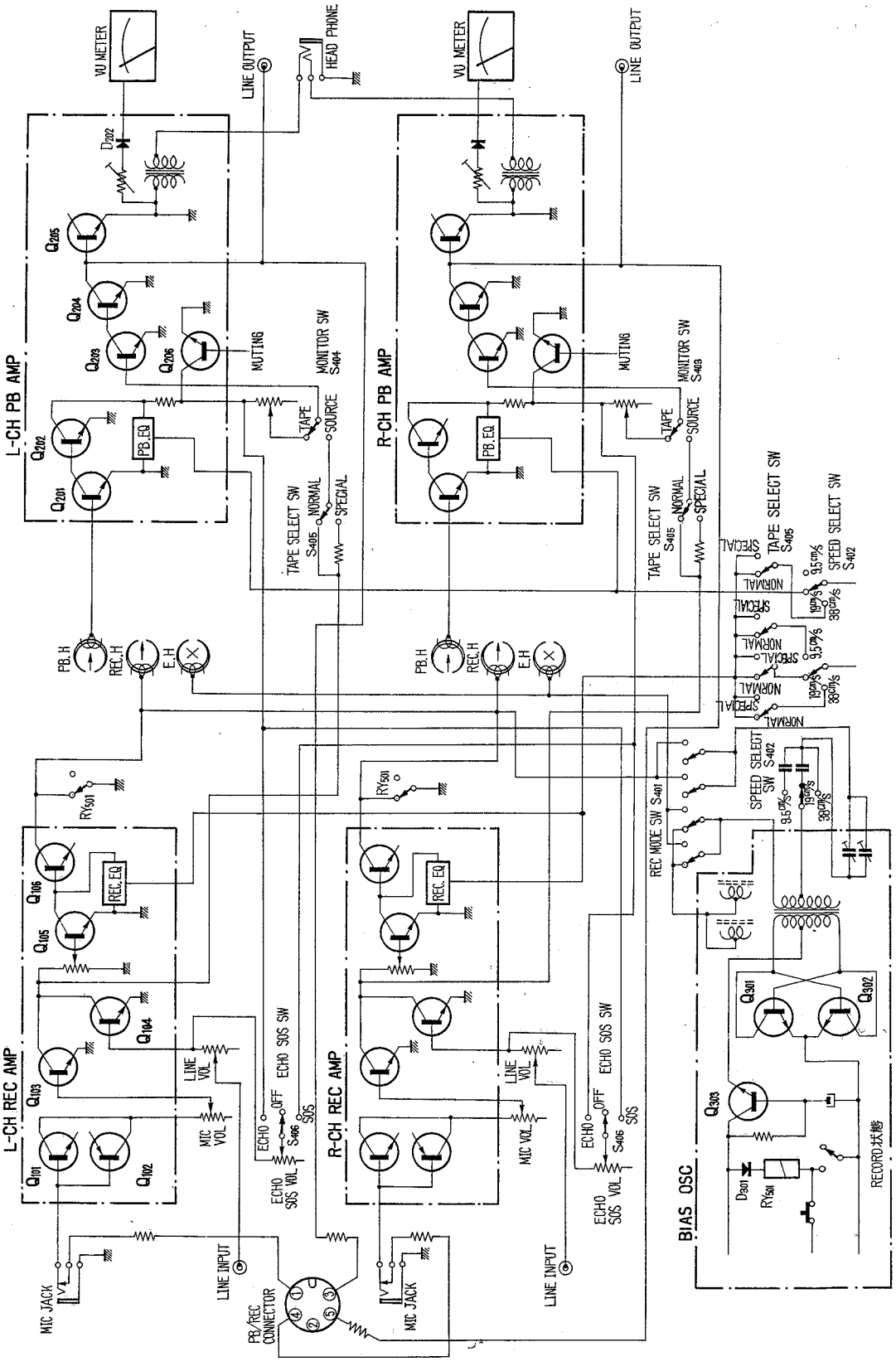
1-1-1. System Control Circuit



1-1-2. Capstan Servo Control Circuit



1-1-3. Audio Amp. and Bias OSC Circuit



1-2. GENERAL

The SONY Model TC-850 which is professional stereo tape recorder utilizing three motors and four heads is equipped with the following features:

* An ac servo controlled capstan drive motor for perfect speed regulation and extremely low wow and flutter regardless of voltage and load fluctuations.
* 10½" (265 mm) reel capacity and built-in reel locks.
* Closed-loop dual capstan tape drive system which permits optimum tape tension and tape-to-head contact.
* Both 2 and 4-track playback heads are provided for maximum versatility and convenience.
* APS (Automatic Program Scanner) and ATS (Automatic Tape Stop) systems to start and stop the tape transport at the desired position.

1-3. TECHNICAL FEATURES

System control of the TC-850 is accomplished by transistor logic, relays, and solenoids. Main functions are as follows:

1-3-1. System Control Circuit

Flip-Flop Circuit

The flip-flop (Fig. 1-3-1) comprises Q606, Q607, R611 through R616, D609, D610, and C623. The normal condition of Q606 is OFF and Q607 is ON. When PLAY pushbutton S904 is depressed, the collector voltage of Q606 and base voltage of Q607 go to 0 volts. This turns Q607 OFF and Q606 ON. The resulting positive voltage developed across R614, R615, and D610 holds Q606 ON. The flip-flop remains in this condition until the automatic shut-off, STOP, FAST FORWARD, or REWIND switches are activated. These switches remove the ground from the emitters of Q606 and Q607, causing the flip-flop to reset.

The collector output of Q606 turns Q610 ON, which energizes PLAY relay RY602. The output also holds bias oscillator relay RY301 energized if RECORD MODE switch S401 and RECORD switch S906 have been activated.

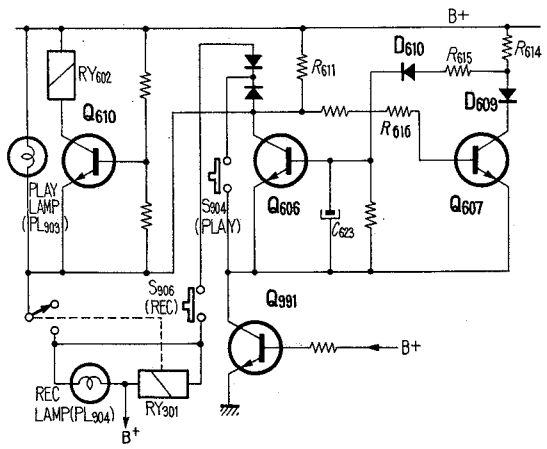


Fig. 1-3-1. Flip-flop circuit

Solenoid Operations

PINCH ROLLER solenoids PM903 and PM904 are energized by Q904 and Q906 respectively. Q904 and Q906 turn ON only when PLAY relay RY602 energizes. TAPE SHIFTER solenoid PM901 is energized by Q903. Q903 turns ON only when PLAY relay RY602 energizes or TAPE SHIFT switch S908 is actuated. BRAKE solenoid PM902 is energized by Q905. Q905 turns ON when the REWIND, PLAY, or FAST FORWARD relay energizes.

To avoid excessive heat built-up in the solenoids during extended operation, the following circuit is used (Fig. 1-3-2). Initially, +23 volts is applied across the solenoid. Also, +23 volts is applied to the network comprising R637 (R640, R634, R647), and C609 (C613, C608, C607). A high potential is instantaneously applied to the base of Q904 (Q906, Q905, Q903).

As the internal impedance of C609 (C613, C608, C607) approaches that of R638 (R641, R635, R648) the voltage at the base decreases. The voltage across the solenoid also decreases.

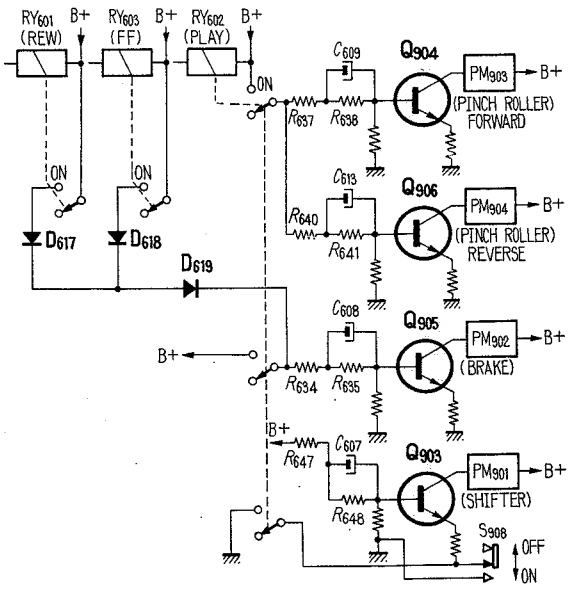


Fig. 1-3-2. Solenoid drive circuit

SHUT-OFF Stage

When a tape is threaded, the Automatic Shut-off (S909) becomes open, cutting off the positive potential applied to the base of transistor Q992 through the resistance network of R993, R994 and R995, turning Q992 OFF. This provides bias to transistor Q991 which then conducts heavily, reducing its collector voltage nearly to ground potential.

If a pulse is received at the base of transistor Q712 (supplied from the ATS circuit output), the collector of Q712 falls to ground potential. This brings the base of Q991 to ground, also, cutting off the operation of Q991 and stopping the transport.

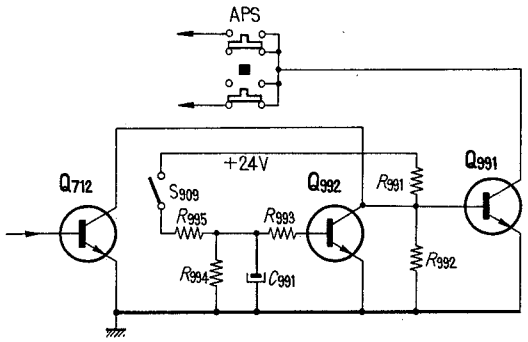


Fig. 1-3-3. SHUT-OFF circuit

1-3-2. APS-ATS Circuit

APS-ATS Oscillator Stage

A Colpitts oscillator circuit is used in the APS-ATS control circuit, operating at approximately 220kHz. Regenerative feedback is derived from the tank circuit (consisting of the sensing head, C701 and C702 capacitors) and is applied to the emitter of Q701 through C702 and R704. Base bias for Q701 is developed across R701 and R702 while the emitter-swamping resistor is R703. This oscillator stage operates constantly. Capacitor C703 and inductor L701 form a series resonant circuit at the oscillator frequency which is coupled to the base of Q702, keeping it ON and maintaining the Q702 collector at emitter ground potential.

If a metallic object, such as the foil sensing tape, passes near the sensing head core, the inductance of the sensing head changes, also changing the oscillation intensity of the tank circuit. Inductor L701 then acts as a short to ground and Q702 is momentarily cut off, resulting in a sharp rise of voltage at the collector of Q702. This produces a positive pulse to the next stage.

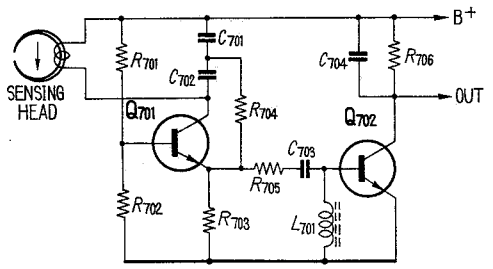


Fig. 1-3-4. APS and ATS oscillator circuit

ATS

When a positive pulse originates from transistor Q702, it is applied to the base of transistor Q703 (through R707 and D701). This turns Q703 ON and it conducts heavily, reducing its collector potential effectively to ground. The ground level of the Q703 collector drops the base of Q704 to ground potential, also, turning Q704 OFF momentarily. (Q704 is normally on.) With the collector of Q704 increasing its positive potential in its OFF condition (due increased impedance), the potential is applied to the base of Q712 which begins to conduct heavily, dropping its collector potential to ground. With the Q712 collector at ground potential, this activates the shut-off circuit as described in the shut-off stage for that function. Q711 and its associated base biasing circuit are to keep Q712 from functioning soon after the tape transport is turned from rewind to play in APS mode. When the mode changes from rewind to play, the foil which activated the change of mode passes again across the sensing head. This supplies positive pulse to base of Q712. However, potential charged in C710 keeps Q711 ON and grounds the pulse supplied from Q704 through R736 for approximately 15 seconds.

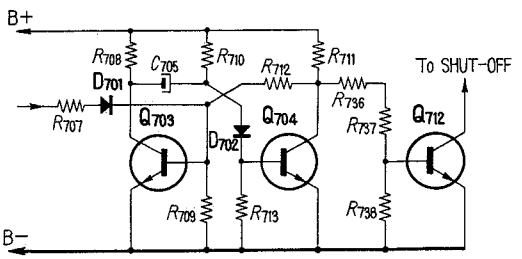


Fig. 1-3-5. ATS circuit

APS

When the APS switch is depressed (closed), the fast forward (FF) relay is activated through D703, putting the recorder in fast forward mode. At the same time, the collector of Q705 is momentarily grounded. This removes bias voltage at the base of Q706 (through R716) and Q706 turns OFF. The collector potential of Q706 rises, therefore, biasing (through R717) the base of Q705 and (through D711) the base of Q711. Both Q705 and Q711 begin to conduct heavily and their respective collectors fall to the emitter ground potential. Simultaneously,

the collector of Q607 is grounded through the FF relay contacts, which are closed as shown in the diagram. No bias is presented to the base of Q606, turning it OFF and turning Q607 ON. With Q607 conducting, the FF relay is self-locked as current flows from the B+ through the relay to ground through Q607. Positive voltage from the normally-off Q703 collector provides bias to the base of both Q707 and Q709. The collector voltage of both Q707 and Q709 is held at emitter ground potential, which in turn prevents bias from reaching the base of Q708 and the base of Q710. Q708 and Q710 are in an OFF condition which keeps the circuit from going into play or rewind modes.

TO REWIND:

When sensing foil crosses the sensing head, a pulse (from Q702) momentarily provides bias at the base of Q703, turning Q703 ON. Q703 conducts and momentarily stops supplying base bias to Q707, which turns OFF. With Q707 turned OFF, positive potential from the collector of Q707 biases the base of Q708 (through R727) and Q708 conducts with its collector dropping to emitter ground potential. This closes the REWIND relay as current flows from B+ through the relay and through Q708 to ground. At this time the self-locking contacts of the FF relay are opened and the self-locking contacts of the REWIND circuit are closed. Switches are now opposite of the diagram positions. Once the REWIND relay is activated, it is self-locked in ON position through its contacts, fast forward relay contacts, and Q607.

TO STOP AND PLAY (from APS rewind mode):

When the sensing foil again crosses the sensing head (now in the APS rewind mode), Q703 again receives a momentary bias pulse (from Q702) and grounds the base of Q709, turning Q709 OFF. A positive potential is then allowed through ZD701, R722 and R733 from the FF relay coil. This potential biases Q710, which turns ON, and the collector of Q710 falls to emitter ground potential, removing bias from the base of Q607, turning it OFF. With Q607 OFF, the self-locking ground is open (remember, all switches are now opposite to the diagram positions) and the REWIND relay is released, stopping the rewind mechanism. Simultaneously, when Q710 is turned ON, its collector, now reduced to emitter ground potential, also applies this emitter ground potential to the collector of Q706 (through D709). The base of Q705 receives no bias, therefore. Q705 turns OFF and Q706 turns ON. With Q705 off, its positive collector voltage charges Q709 which delivers bias to the base of Q709 after a capacitive time-delay (through C709 and R728). This time delay is necessary to keep Q709 OFF for a short period right after Q710 is turned off.

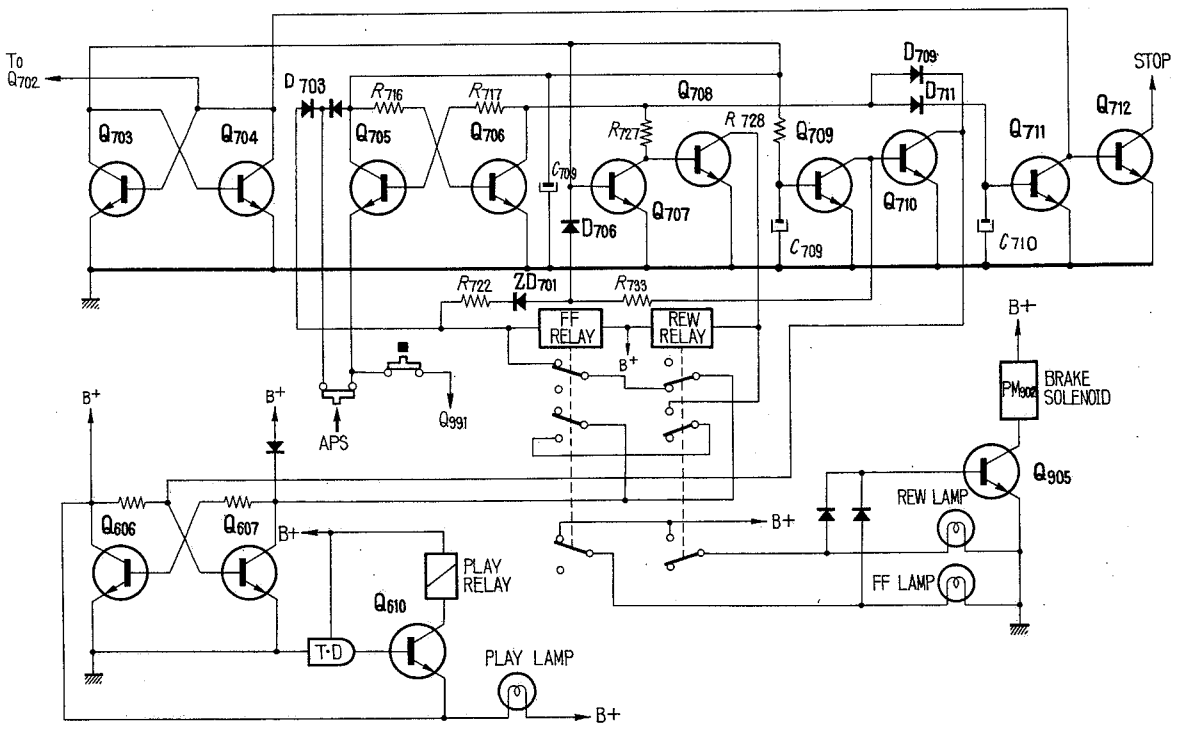


Fig. 1-3-6. APS and ATS circuit

	APS (To Fast Forward)	FOIL REACHES SENSING HEAD IN F.F. MODE (To Rewind)	FOIL REACHES SENSING HEAD IN REW. MODE (To STOP and PLAY)
Q703	OFF	ON (Momentarily)	ON (Momentarily)
Q704	ON	OFF (Momentarily)	OFF (Momentarily)
Q705	ON	ON	OFF
Q706	OFF	OFF	ON
Q707	ON	OFF	ON
Q708	OFF	ON	OFF
Q709	ON	ON	OFF
Q710	OFF	OFF	ON
Q711	ON	ON	ON
Q712	OFF	OFF	OFF

1-3-3. CAPSTAN SERVO-CONTROL Stage

Since it is a well-known fact that the capstan servo-control system brings many advantages over the conventional capstan motors driven directly by the AC power line, only technical function of the circuit is explained here, leaving the flowery words to advertising people.

The following is the basic block diagram of the capstan servo-control system used for the SONY Model TC-850.

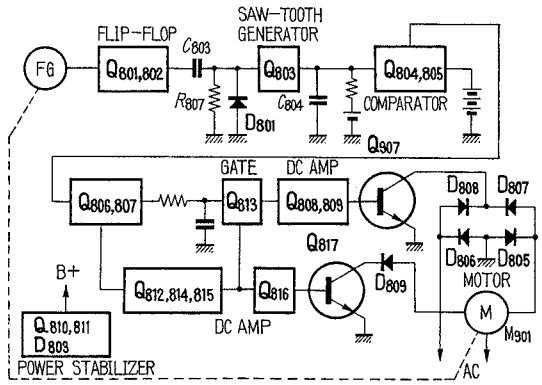


Fig. 1-3-7. Block diagram (Capstan servo-control circuit)

The motor used in this system is a type of AC torque motor, the speed and torque of which can be controlled by changing the supply voltage, with an AC frequency generator (FG) coupled coaxially to its shaft. The output of the FG is connected to the servo-control electronics to trigger the flip-flop (Q801 and Q802) which generates square wave output at the collector. This output is then differentiated and rectified by C803, R807 and D801 turning the wave form into positive pulses. These pulses trigger the saw-tooth generator (Q803). The saw-tooth output of Q803 is led to the comparator consisting of Q804 and Q805. Only for the period when the potential of saw-tooth wave becomes higher than the potential at the emitter of Q804 and Q805, Q804 becomes conductive and supplies pulsating signal to Q806, which inverts the phase of the pulse signal. The signal then goes through a buffer stage (Q807) and passes through a low-pass filter for smoothing. The smoothed DC potential, which varies in direct proportion to the duration time of the pulse at emitter of Q807, controls the output of the DC amplifier consisting of Q808 and Q809. The output at the emitter of Q809 varies the impedance between collector and emitter of Q907, which is inserted in series with the capstan drive motor.

When, by a certain cause, the motor is rotating at a speed slower than the intended speed, the frequency of FG is also lower than the predetermined figure, which results in longer interval between the pulses for saw-tooth triggering. The longer interval between the pulses causes higher saw-tooth wave height, which in turn brings in a longer duration of "ON" period of Q804. Therefore, the output pulse at the emitter of Q807 becomes wider, which means higher positive biasing of Q808 resulting in less collector-emitter impedance of Q907 to increase the speed of the motor. When the motor is running too fast, operation of the servo system is vice versa. The equilibrium of the servo system is obtained where the highest potential of the saw-tooth wave becomes equal to the emitter potential of Q804 and Q805.

Tape speed selection is accomplished by changing the time constant of the saw-tooth generator Q803 and by selecting proper parameters in the smoothing low-pass filter.

Starting: The moment when the power switch of the recorder is turned on, the situation of the servo-control circuit and motor is as follows:

Q803	Q804	Q806	Q807	Q808	Q809	Q907	MOTOR
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF

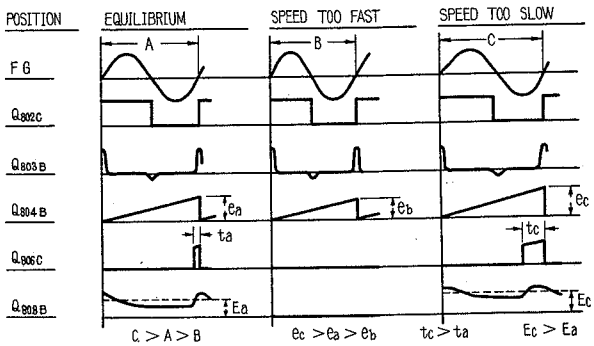
This situation continues until the charged potential across C804 becomes higher than the potential

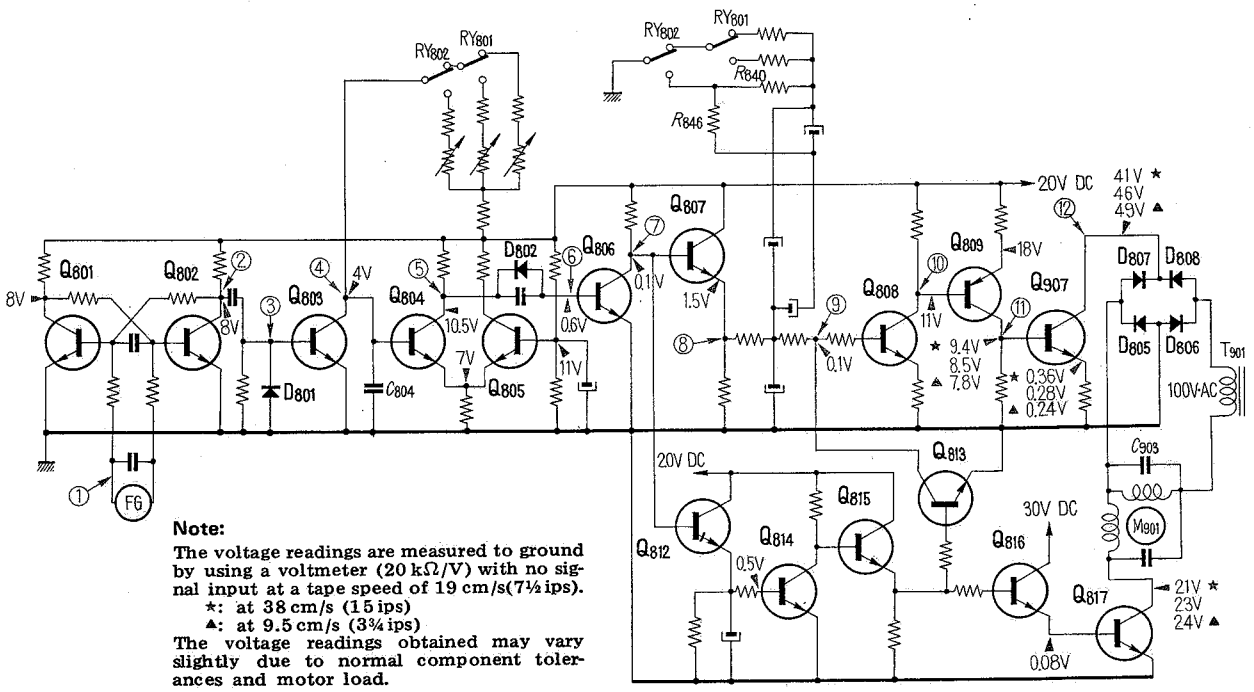
at the emitter of Q804 and Q805. When the potential across C804 becomes high enough to make Q804 conductive, the potential at collector of Q804 becomes lower than the zener voltage of D802, thus turning OFF Q806. The OFF situation of Q806 turns ON all the transistors Q807, Q808, Q809 and Q907, as well as the motor. Once the motor is started, its speed is controlled by the frequency generated by the coaxial generator as explained earlier.

Electromagnetic Braking: When changing tape speed to a slower position while the tape is in motion, it is necessary to force the speed down to make the change quick. This is accomplished by applying brake to the motor electromechanically. The change of speed selector switch to a slower position causes longer rise time of saw-tooth wave at the base of Q804 and induces base bias to Q806 to turn it ON. Then, the potential at the collector of Q806 becomes almost zero against the ground. This low potential turns OFF Q812 and, therefore, Q814. The OFF situation of Q814 turns ON Q815 generating higher potential at its emitter. This potential turns ON Q813, which shorts the servo-control signal to ground to inactivate the circuit. Meanwhile, the potential at the emitter of Q815 turns ON Q816 and Q817 to induce braking current in the motor windings through D809, Q817 and D808. Once the frequency of FG becomes low enough to turn ON Q804 (and, therefore, to turn OFF Q806), the servo-control system takes over the motor speed control.

Stability: Since the supply potential to the servo-control circuit affects the tape speed, a voltage stabilizer consisting of Q810, Q811 and D803 is used for maximum stability of the supply potential. Also, the high stability of the circuit owes to the self-compensating comparator stage (Q804 and Q805) and use of silicon transistors throughout.

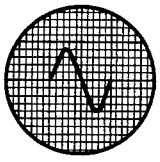
Wave Forms and Voltages: The wave forms at each stage and their relation and voltage are as follows:



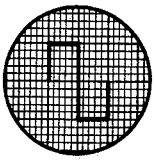


Note:
The voltage readings are measured to ground by using a voltmeter (20 kΩ/V) with no signal input at a tape speed of 19 cm/s(7½ ips).
★: at 38 cm/s (15 ips)
▲: at 9.5 cm/s (3¾ ips)
The voltage readings obtained may vary slightly due to normal component tolerances and motor load.

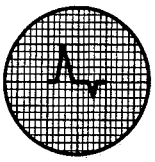
Fig. 1-3-8. Capstan servo-control circuit

① 

15 ips – 1,151 Hz, 7.6 Vp-p
7½ ips – 575 Hz, 3.2 Vp-p
3¾ ips – 288 Hz, 1.52 Vp-p

② 

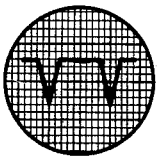
18 Vp-p

③ 

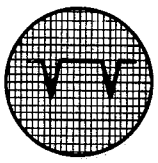
1.2 Vp-p

④

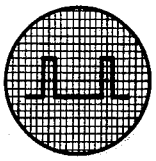
9 Vp-p

⑤ 

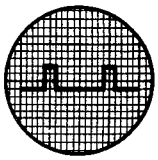
3 Vp-p

⑥ 

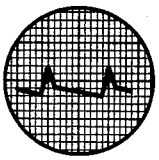
3 Vp-p

⑦ 

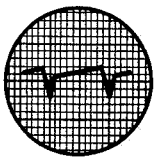
7.6 Vp-p

⑧ 

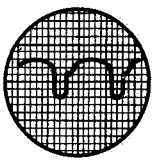
5.2 Vp-p

⑨ 

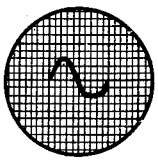
0.08 Vp-p

⑩ 

0.3 Vp-p

⑪ 

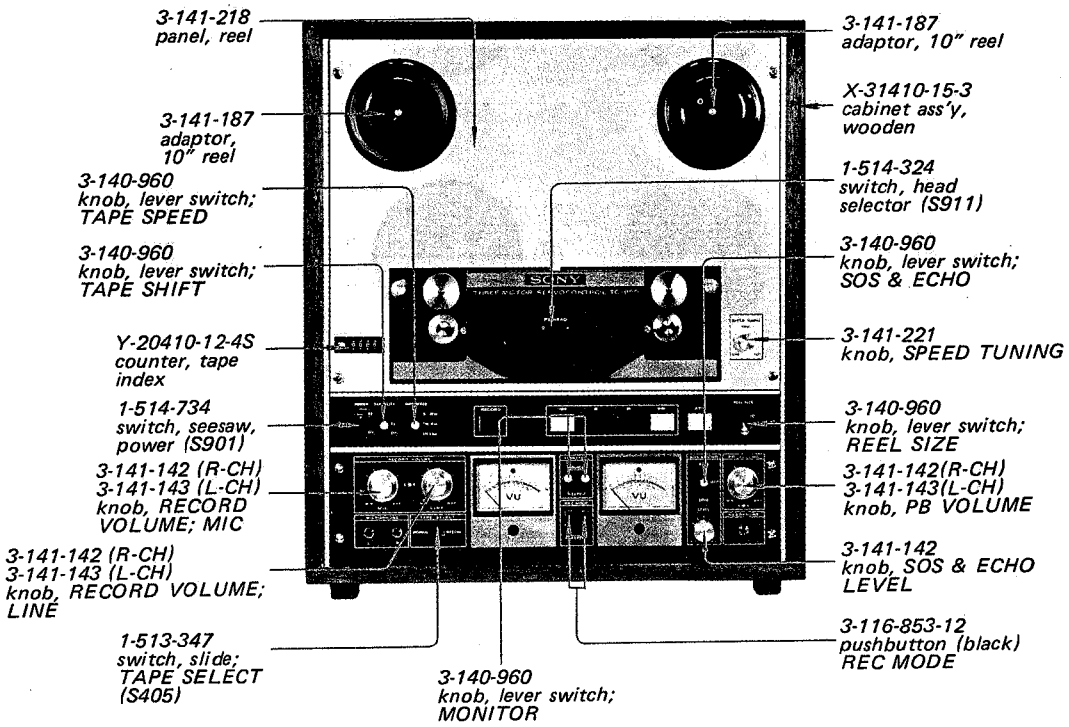
0.5 Vp-p

⑫ 

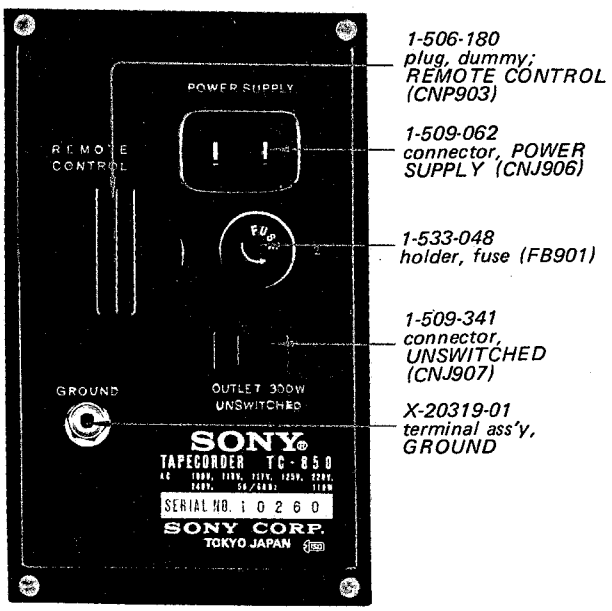
80 Vp-p

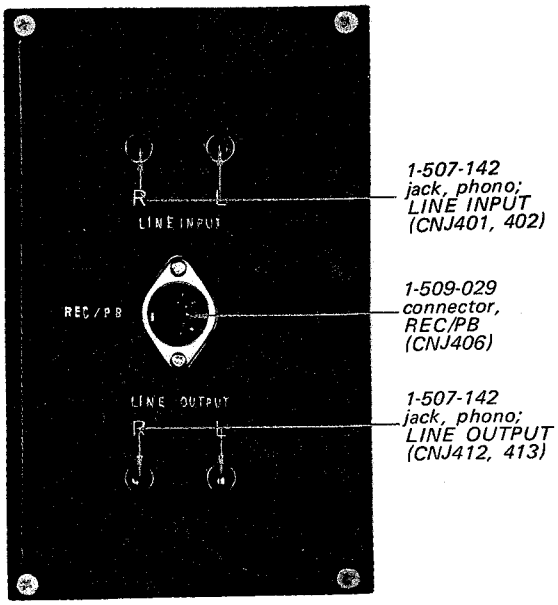
1-4. MAJOR PARTS LOCATIONS

Cabinet — Top View —

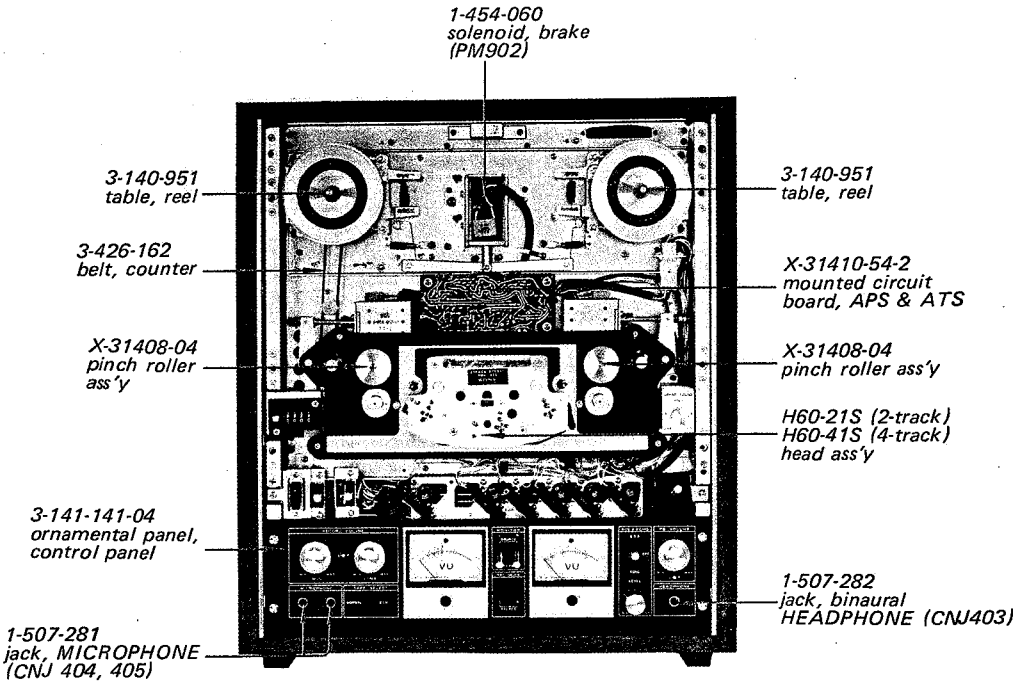


Cabinet — Side Views —

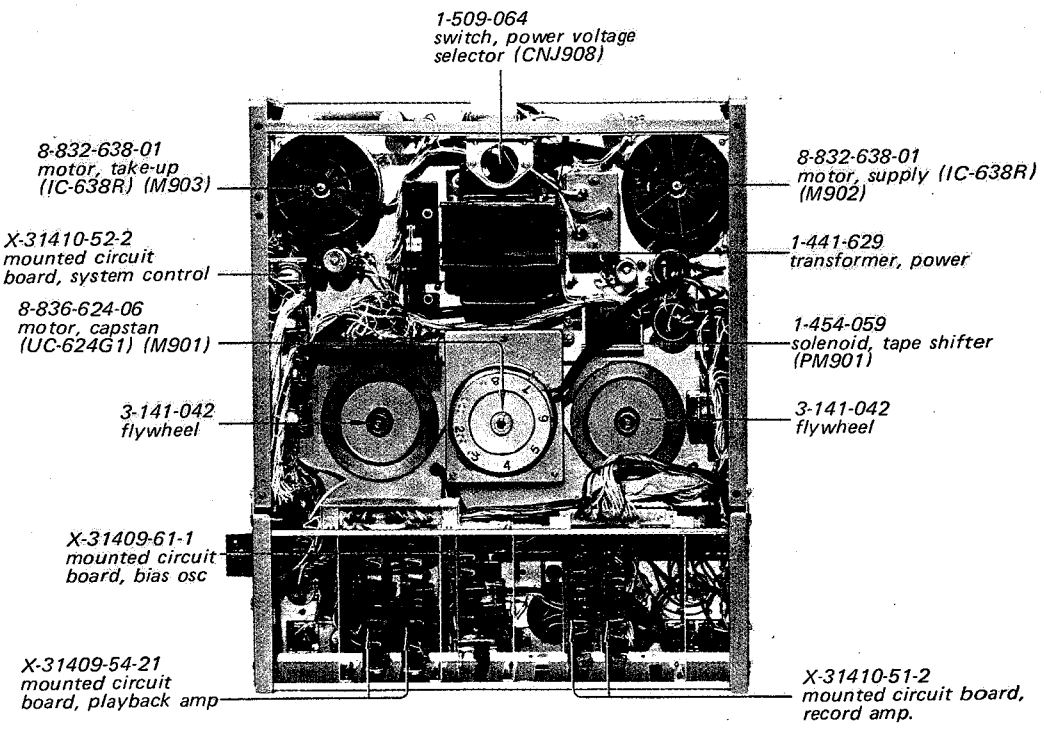




Chassis – Top View –



Chassis – Bottom View –



SECTION 2
DISASSEMBLY

2-1. PANEL REMOVAL

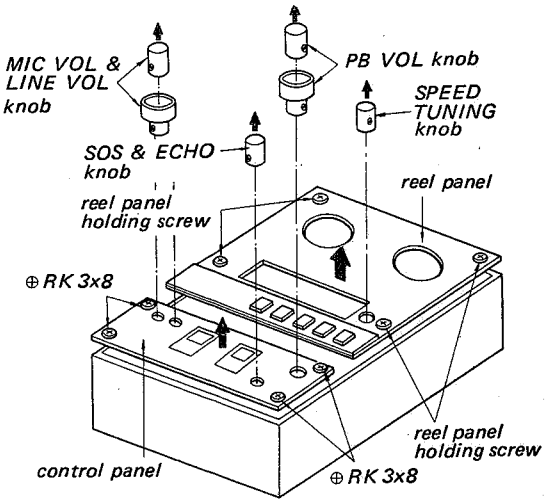


Fig. 2-1. Panel removal

2-2. CABINET REMOVAL

(1) Remove the six screws shown with ● in Fig. 2-2.

(2) Take out the chassis from the cabinet.

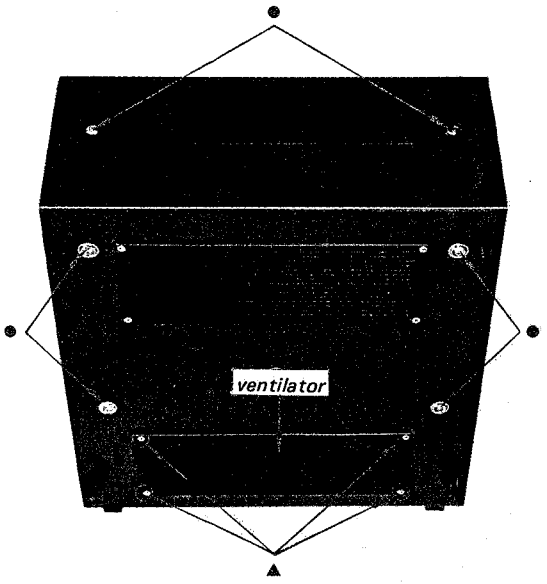


Fig. 2-2. Cabinet removal

2-3. PRINTED CIRCUIT BOARD REMOVAL

(A) REC AMP, PB AMP & Bias OSC Circuit Board

Remove the ventilator by taking off four wood screws (⊕K 4x10) marked with ▲ in Fig. 2-2. Pull off the printed circuit boards.

Here the voltage check can be made by removing the cabinet or by using the special jig (Part No. X-31400-99) without the cabinet removed.

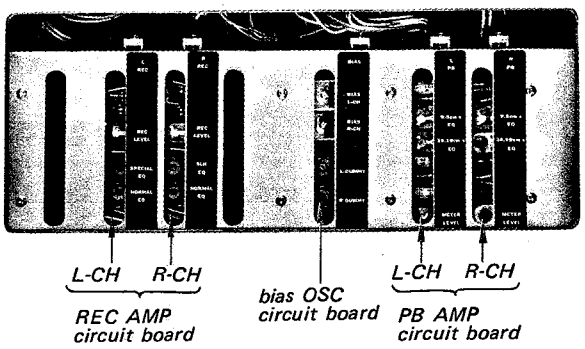


Fig. 2-3. REC AMP, PB AMP & Bias OSC Circuit board removal

(B) APS & ATS Circuit Board

① Remove the reel panel.

② Remove the four screws securing the circuit board at each corner.

(C) System Control & Capstan Servo Control Circuit Boards

① Remove the cabinet.

② Remove the two screws securing the each printed circuit board in Fig. 2-4 and Fig. 2-5.

③ The printed circuit board can now be opened in the direction shown by the arrow in Fig. 2-4 and Fig. 2-5.

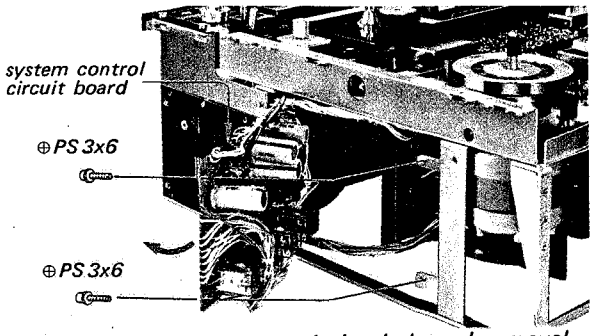


Fig. 2-4. System control circuit board removal

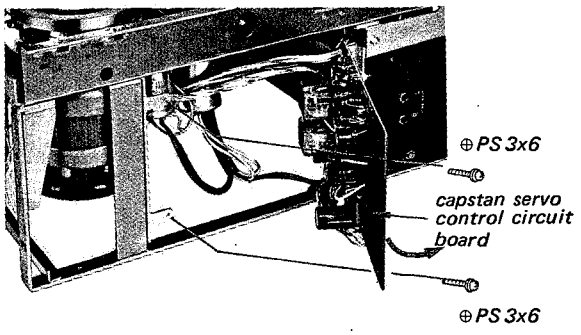


Fig. 2-5. Capstan servo control circuit board removal

SECTION 3
MAINTENANCE

Introduction

Under normal operating and environmental conditions, the tape recorder requires no special maintenance. The only requirements are routine cleaning and demagnetization of the heads and lubrication.

3-1-1. Lubrication

Use light machine oil and lubricate the pinch roller shaft. Avoid excessive lubrication. It will cause slippage of the mechanism. If the oil should spill on the pinch roller or the rubber belt, wipe it off immediately with denatured alcohol. To lubricate it, proceed as follows:

(1) Remove the head cover and the screw securing pinch roller and then lubricate the pinch roller shaft with one drop of light machine oil.

3-1-2. Cleaning

Dusts and dirts which were brought by tape may stick to the core of the record, playback or erase head, and they may deteriorate performance of the heads. So wipe off the surface of head which contacts tape, with a clean and soft cloth dampened with denatured alcohol. To insure proper operation, the heads should be cleaned at least once during each ten hours of actual operation.

CAUTION

Do not use any other solvent on the head as some will damage the material which binds the head laminations together. Also do not use any metallic device which scratch the head. At the same time, clean capstan, rubber belt, pinch roller, tape guide, flutter roller and tension arm.

3-1-3. Demagnetizing

The record and playback heads may occasionally acquire a degree of permanent magnetization, which will result in an increase of noise level, distortion of any recorded signal, and a gradual erasure of high frequency on any recorded tape which passed over them. These heads may be easily demagnetized with a SONY head demagnetizer HE-2 (optional accessory) or equivalent.

To demagnetize the heads, proceed as follows:

(1) Remove the head cover.

(2) Make sure that power switch on the TC-850 is in the OFF position.

(3) Connect the demagnetizer to ac power source.

(4) Bring the tips of the demagnetizer in close proximity to, but not in contact with, the heads so that the tips straddle the gap in the center of the head, run the tips up and down the heads several times, and then slowly withdraw the demagnetizer. The slow withdrawal is essential to proper demagnetization.

CAUTION

Do not bring magnet close to heads.

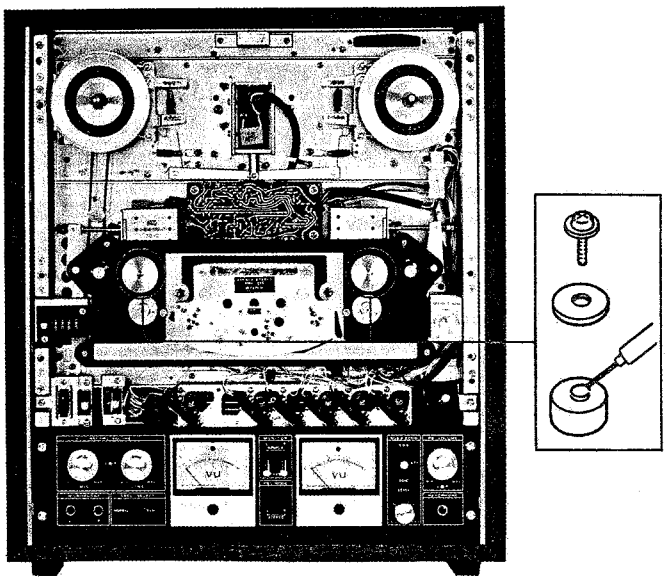


Fig. 3-1. Lubrication

SECTION 4
ADJUSTMENT PROCEDURES

4-1. MECHANICAL ADJUSTMENTS

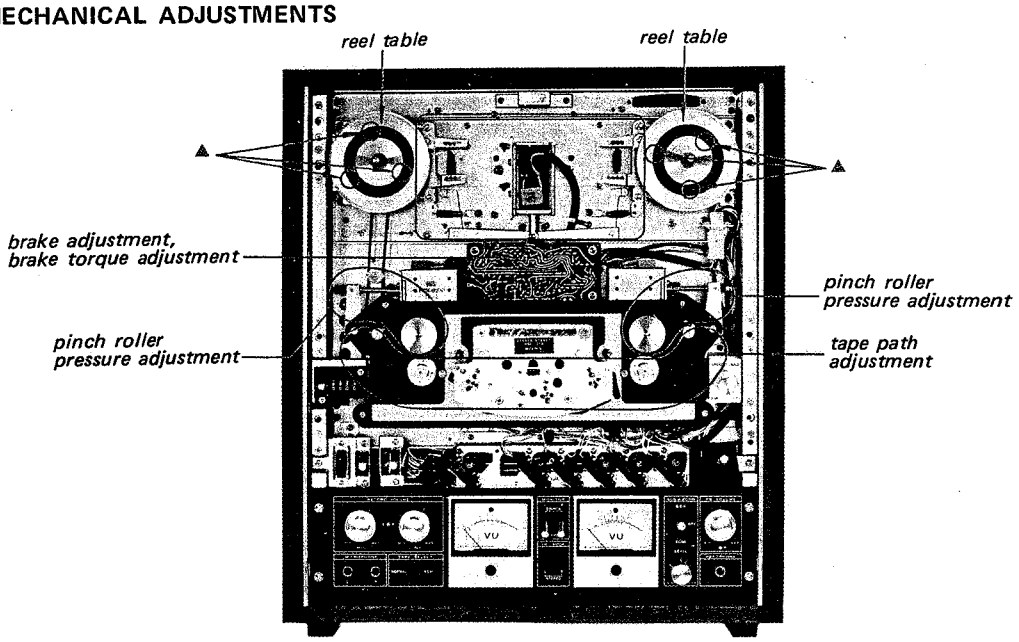


Fig. 4-1-1. Adjusting parts location

4-1-1. Brake Adjustment
(See Fig. 4-1-2.)

Make the brake adjustment, if proper tape tensioning is not maintained in the STOP mode.

Steps:

(1) Remove the reel panel, referring to "Panel Removal" on page 14.

(2) Remove the reel table by removing the six screws marked with ▲ in Fig. 4-1-1.

(3) Place the unit in the STOP mode.

(4) Loosen the two screws marked with ● at the take-up and the supply brake bands.

(5) Temporarily tighten the screws marked with ● while pulling the brake band in the direction shown by the arrow as far as it will go.

(6) When pushing the pole piece of solenoid slowly into its housing by the hand, the releasing plates of the take-up side and the supply side should touch the each brake lever at a time. If not, loosen the screw marked with ● of the part at which the releasing plate touches the brake lever faster than the other one and adjust the length of the brake band.

(7) Place the unit in the PLAY mode.

(8) Be sure that the brake solenoid is energized.

(9) Loosen the three screws marked with ■ and adjust by positioning the brake solenoid holding plate so that the three screws are in the middle of the respective oval-shaped holes of the brake solenoid holding plate.

(10) There should be a clearance of approximately 0.5 mm (1/64") equally between the brake lining and the brake drum.
If not, loosen the screw marked with ● and adjust by positioning the brake band.

Note: If the 0.5 mm clearance is not obtained yet, loosen the three screws marked with ■ and adjust by positioning the brake solenoid holding plate.

(11) Repeat the steps (6) through (10) until the satisfactory result is obtained.

(12) Place the unit in the STOP mode.

(13) Loosen the two screws marked with △ and adjust by positioning the stopper so that a clearance between the releasing plate and

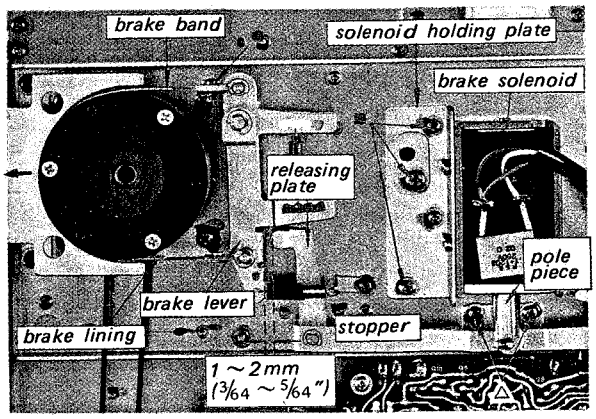


Fig. 4-1-2. Brake adjustment

the brake lever is 1 ~ 2 mm (3/64 ~ 5/64") as shown in Fig. 4-1-2.

(14) Be sure that the center pole surely comes in contact with the stopper in the STOP mode.

4-1-2. Brake Torque Adjustment
(See Fig. 4-1-3.)

This adjustment should be performed for both supply and take-up sides after the brake adjustment.

Note: Words in [ ] are applied to the take-up brake torque adjustment.

Steps:

(1) Place the unit in the STOP mode.

(2) Place a 7" reel with string wound several turns counterclockwise [clockwise] on the hub (44 mm) onto the reel table.
Tie the string to a spring scale.

(3) Pull the scale in the direction shown by the red arrow, making sure that the string does not touch either flange of the reel. The reel table will rotate counterclockwise [clockwise].
Take a reading only when the reel table is in steady motion.

(4) Adjust the position of spring A so that a scale reading is between 1,800 g·cm and 2,200 g·cm (25.0 oz·inch and 30.6 oz·inch).

(5) Rewind the string by turning the reel counterclockwise [clockwise].

(6) Turn string several times clockwise [counterclockwise] on the hub (44 mm) onto the reel table.

(7) Pull the scale in the direction shown by the black arrow, making sure that the string does not touch either flange of the reel. The reel table will rotate clockwise [counterclockwise].
Take a reading only when the reel table is in steady motion.

(8) Adjust the angle of the spring hook by loosening the screw (E) so that a scale reading is between 650 g·cm and 750 g·cm (8.95 oz·inch and 10.4 oz·inch).

SPECIFICATION:

Brake Torque of Supply Reel
in clockwise turning ..... 650 ~ 750 g·cm (8.95 ~ 10.4 oz·inch)
in counterclockwise turning ..... 1,800 ~ 2,200 g·cm (25.0 ~ 30.6 oz·inch)

Brake Torque of Take-up Reel
in clockwise turning ..... 1,800 ~ 2,200 g·cm (25.0 ~ 30.6 oz·inch)
in counterclockwise turning ..... 650 ~ 750 g·cm (8.95 ~ 10.4 oz·inch)

4-1-3. Take-up Tension and Back Tension Adjustment of Reel Table
(See Fig. 4-1-4 and Fig. 4-1-5.)

Note: Set the TAPE SPEED switch to 7½ ips (19 cm/s).
Hold the actuator so that the SHUT-OFF switch is activated (a rubber band or piece of masking tape will hold the actuator as though tape were threaded on the unit).

A Take-up Tension Adjustment

(1) Set the reel size selector switch S910 to 10".

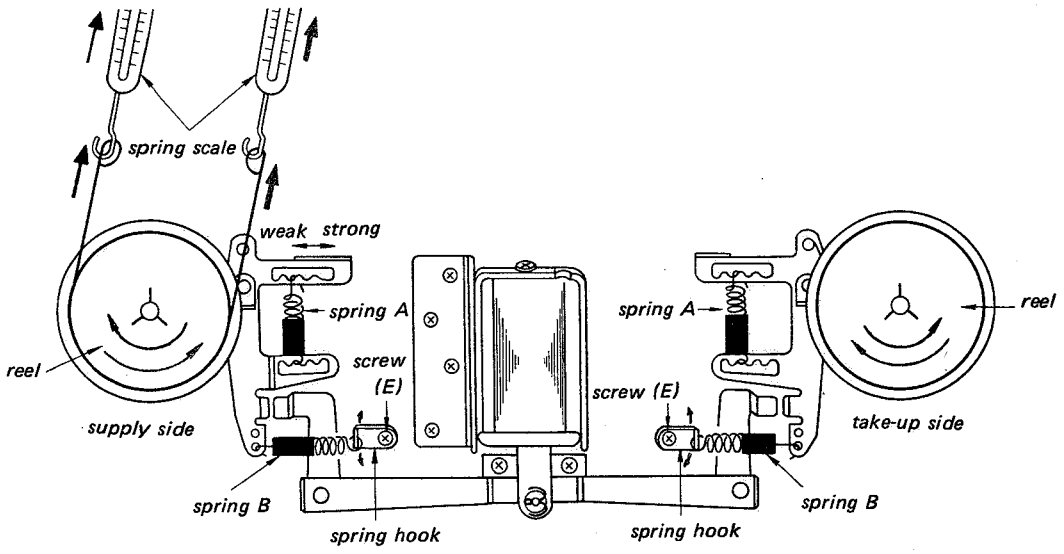


Fig. 4-1-3. Brake torque adjustment

(2) Place a 10" reel with string wound several turns clockwise on the hub (76 mm) onto the take-up reel table.
Tie the string to a spring scale.

(3) Place the unit in the PLAY mode.

(4) Pull a spring scale and then allow to take up the string on the reel while approaching the scale to the reel at the same speed of tape running [7½ ips (19 cm/s)].

(5) Adjust the upper side slider on resistor R903 so that a scale reading is between 400 g·cm and 500 g·cm (5.6 oz·inch and 7.0 oz·inch).

(6) Place the unit in the STOP mode.

(7) Set the reel size selector switch S910 to 7".

(8) Place a 7" reel with string wound several turns clockwise on the hub (44 mm) onto the take-up reel table.
Tie the string to the spring scale.

(9) Perform the steps (3) and (4) in order.

(10) Adjust the lower side slider on resistor R903 so that a scale reading is between 280 g·cm and 320 g·cm (3.9 oz·inch and 4.5 oz·inch).

B Back Tension Adjustment

(1) Set the reel size selector switch S910 to 10".

(2) Place a 10" reel with string wound several turns counterclockwise on the hub (76 mm) onto the supply reel table.
Tie the string to the spring scale.

(3) Place the unit in the PLAY mode.

(4) Pull a spring scale and then allow to take up the string on the reel while approaching the scale to the reel at the same speed of tape running [7½ ips (19 cm/s)].

(5) Adjust the upper side slider on resistor R902 so that a scale reading is between 450 g·cm and 550 g·cm (6.3 oz·inch and 7.6 oz·inch).

(6) Place the unit in the STOP mode.

(7) Set the reel size selector switch S910 to 7".

(8) Place a 7" reel with string wound several turns counterclockwise on the hub (44 mm) onto the supply reel table.
Tie the string to the spring scale.

(9) Perform the steps (3) and (4) in order.

(10) Adjust the lower side slider on resistor R902 so that a scale reading is between 180 g·cm and 220 g·cm (2.5 oz·inch and 3.1 oz·inch).

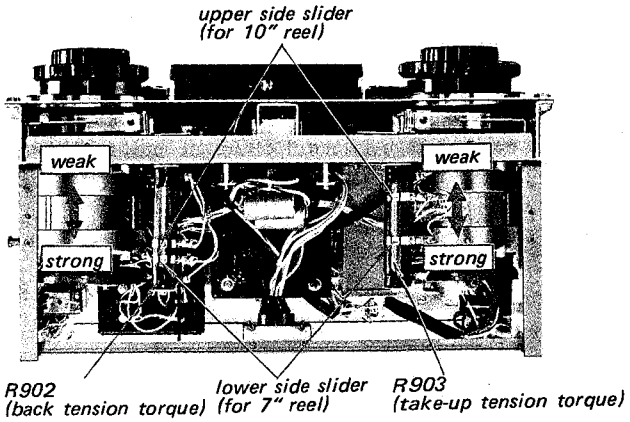


Fig. 4-1-4. Adjusting parts location

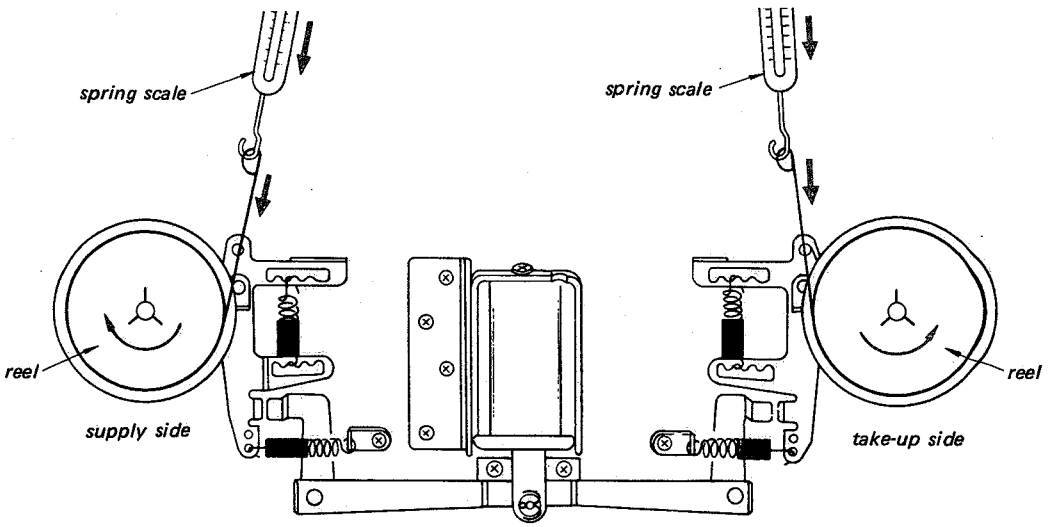


Fig. 4-1-5. Take-up tension and back-tension adjustment of reel table

4-1-4. Pinch Roller Pressure Adjustment
(See Fig. 4-1-6 and Fig. 4-1-7.)

Steps:

(1) Remove the reel panel referring to "Panel Removal" on page 14.

(2) Place the unit in the STOP mode.

(3) Push the pole piece of the solenoid into its housing by the hand, and make sure that the clearance between the ring and the pinch roller lever is 0.5 ~ 1 mm (1/64 ~ 3/64").

(4) Make a loop with a piece of string and attach the spring scale to the pinch roller shaft with the loop of string. See Fig. 4-1-6.

(5) Hold the actuator so that the SHUT-OFF switch is activated (a rubber band or piece of masking tape will hold the actuator as though tape were threaded on the unit).

(6) Place the unit in the PLAY mode.

(7) Pull the scale horizontally in the direction shown by the arrow. The capstan shaft, pinch roller and the scale should be in a line.

(8) Check a scale reading when the pinch roller just leaves the capstan shaft.

(9) Adjust the adjusting nut so that a scale reading is between 1 kg and 1.4 kg (2.2 lb and 3.1 lb).

(10) Make sure that the solenoid operates normally when a mode is changed from the PLAY to the STOP and vice versa several times. If the tape slips, readjust the above steps.

(11) Lock the adjusting nut with the lock nut.

Note: Be careful not to move the adjusting nut.

(12) Apply lock paint to the nuts.

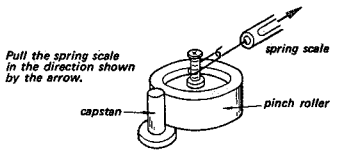


Fig. 4-1-6. Pinch roller pressure adjustment

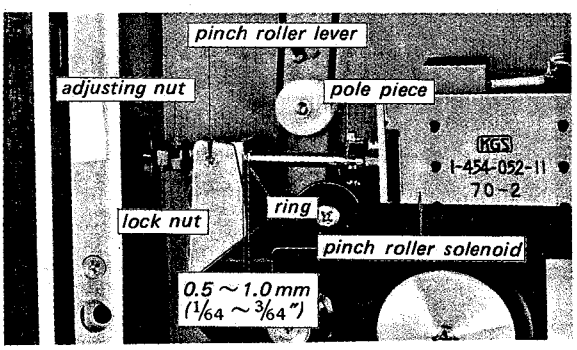


Fig. 4-1-7. Pinch roller pressure adjustment

4-1-5. Tape Path Adjustment
(See Fig. 4-1-8.)

Steps:

(1) Attach a head assembly to the unit.

(2) Tighten two head assembly holding screws.

(3) Thread a blank tape.

(4) Place the unit in the PLAY mode.

(5) Align the upper edge of the tape just on the upper edge of the 4 track (2 track) p.b. head core by turning the locking screw located on the left side of the 4 track (2 track) p.b. head.

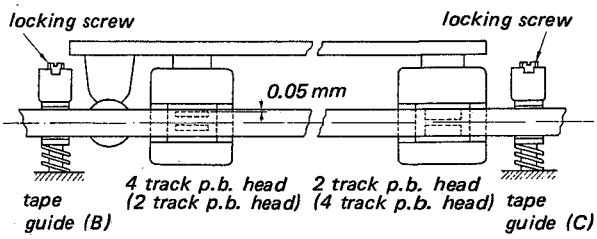
(6) Turn the locking screw located on the left side of the 4 track (2 track) p.b. head counterclockwise by approximately 5° from the position obtained in the preceding step (5), so that the upper edge of the tape is approximately 0.05 mm higher than that of the 4 track (2 track) p.b. head.

(7) Align the upper edge of the tape just on the upper edge of the 2 track (4 track) head core by turning the locking screw on the right side of the 2 track (4 track) p.b. head.

(8) Remove a screw (⊕K 2.6x6) on the tape guides, (A) and (D) located near the pinch rollers.

(9) Adjust by turning the upper portion of the tape guides, (A) and (D), so that the tape goes through the middle portion of the tape guides, (B) and (C).

(10) After the adjustment, fix the tape guides, (A) and (D), with the screws.



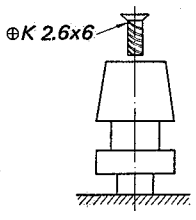


Fig. 4-1-8. Tape path adjustment

4-2. ELECTRICAL ADJUSTMENTS

Precaution:

Before making the adjustments, carefully read the following:

(1) Set the switches to the position indicated below, unless otherwise specified.
- TAPE SPEED switch ..... 7½ ips (19 cm/s)
- SOS/ECHO switch ..... OFF
- MONITOR switch ..... TAPE
- TAPE SELECTOR switch ..... NORMAL
- Reel size selector switch ....7" (178 mm) reel
- TAPE SHIFT switch ..... OFF

(2) Set the PB volume control at the level of 0 dB (0.775 V) on the VTVM when playing back the first tone (400 Hz, 0 dB) of SONY alignment tape J-19-F2, unless otherwise specified.

(3) Connect a VTVM and a 100 kΩ resistor in parallel with the LINE OUT jack.

(4) Adjustment should be performed for both L-CH and R-CH.

(5) Clean the heads with soft cloth dampened with denatured alcohol and also demagnetize them with a head demagnetizer.

(6) A blank test tape should use a new tape or a sufficiently-demagnetized tape.

(7) The test equipments required for the adjustment are as follows:

Audio oscillator
Attenuator
100 kΩ, 2.2 kΩ and 22 kΩ resistors
VTVM
Standard tape
SONY SLH tape
Non-magnetic screwdriver
SONY alignment tapes J-19-A2, J-19-F2

(8) SONY alignment tapes contain the following information in the sequence indicated.

tone / tape	1st	2nd	3rd	4th	5th	6th	7th
J-19-A2	12.5 kHz (−10 dB)						
J-19-F2	400 Hz 0 dB	400 Hz −10 dB	10 kHz −10 dB	12.5 kHz −10 dB	7 kHz −10 dB	80 Hz −10 dB	40 Hz −10 dB

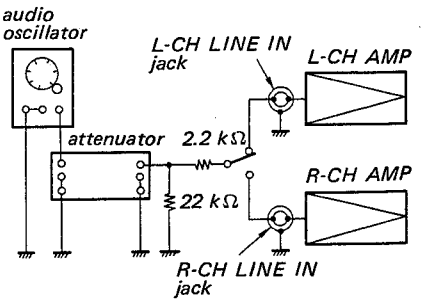


Fig. 4-2-1. Input connection

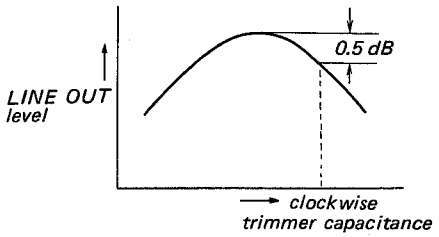


Fig. 4-2-2. Record bias characteristics

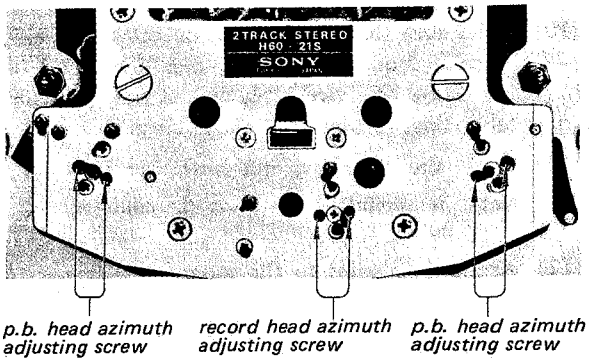


Fig. 4-2-3. Adjusting parts location (1)

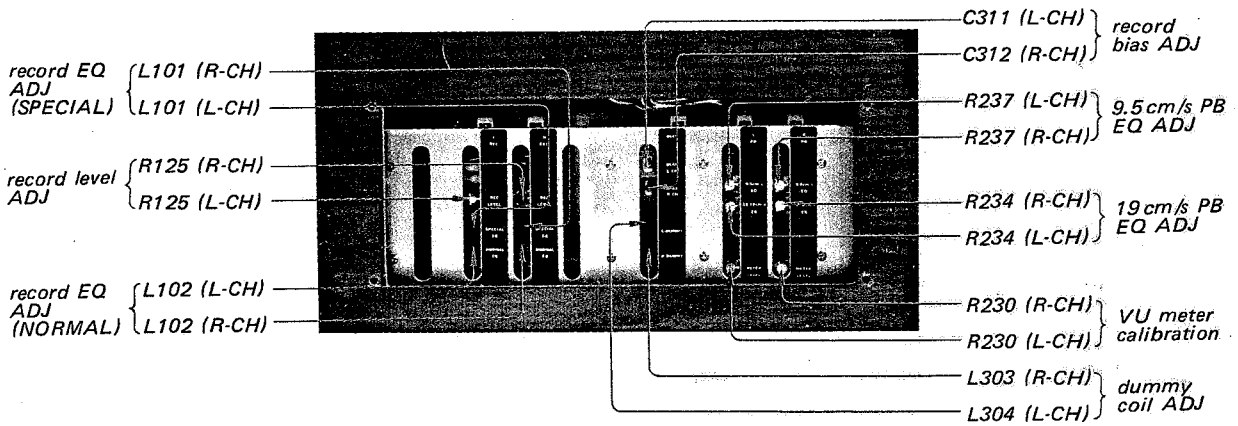
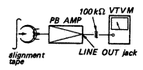
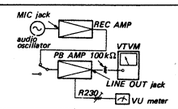
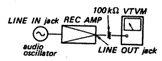


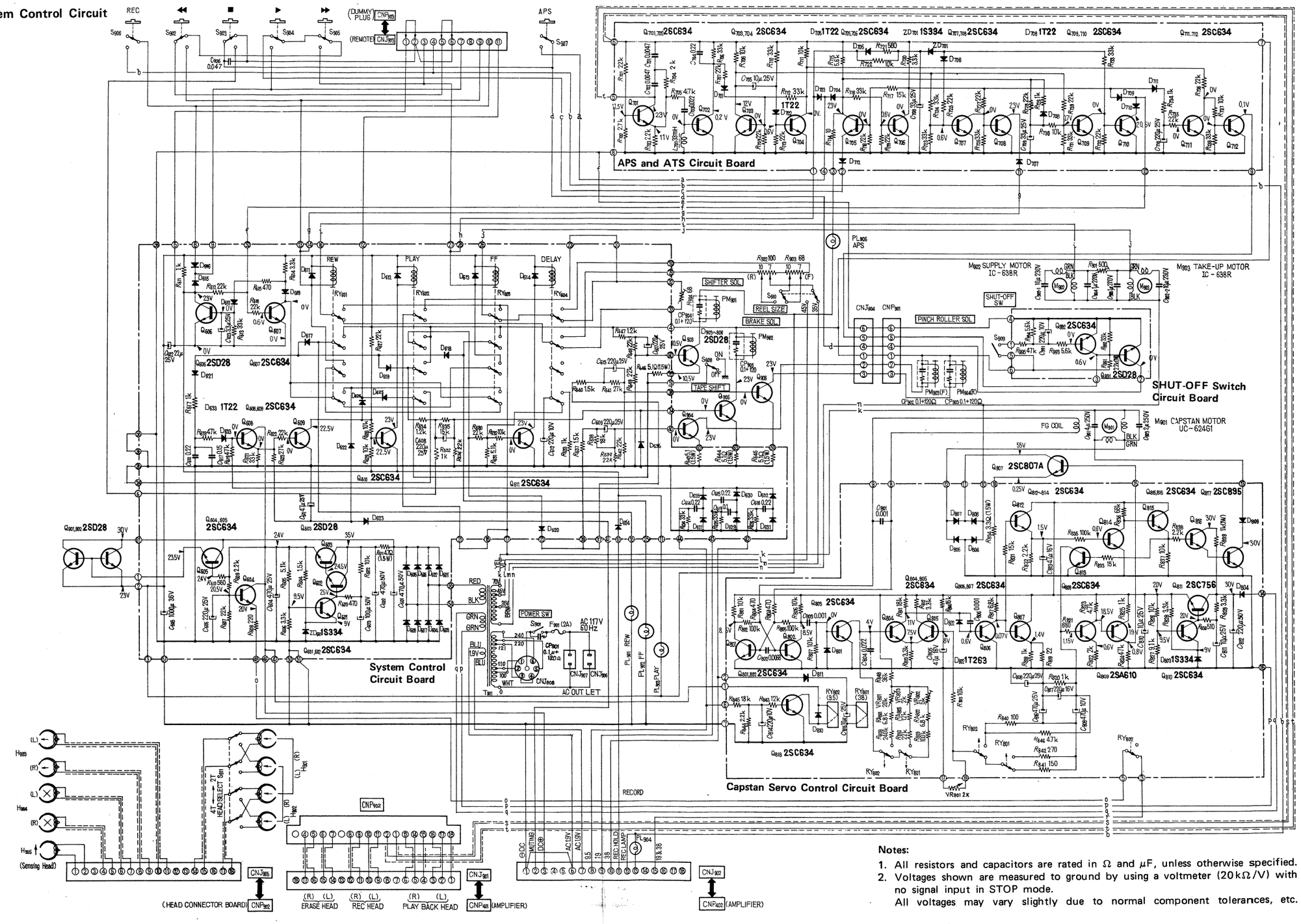
Fig. 4-2-4. Adjusting parts location (2)

Item	Signal Source	Setup	Mode	Adjust	Remarks
1. Playback Head Azimuth Adjustment	SONY alignment tape J-19-A2 (12.5 kHz, –10 dB)		Playback	Azimuth Adjusting Screws (See Fig. 4-2-3)	(1) Set the TAPE SPEED switch to 3¾ ips (9.5 cm/s). (2) Set the MONITOR switch to TAPE. (3) Adjust for maximum reading on the VTVM. **Note:** When the same maximum output cannot be obtained at both channels, take the middle between the two positions of the screw in the maximum output levels. The difference between the two levels should be within 2.5 dB. (4) Check for the tape running.
2. Playback Equalizer Adjustment	2nd (400 Hz, –10 dB) and 3rd (10 kHz, –10 dB) tones of SONY alignment tape J-19-F2	Same as Item 1	Playback	7½ ips (19 cm/s) ...R234 (Both L-CH and R-CH) 3¾ ips (9.5 cm/s) ...R237 (Both L-CH and R-CH) (See Fig. 4-2-4)	(1) Set the MONITOR switch to TAPE. (2) Set the PB HEAD selector switch to "2". (3) Set the TAPE SPEED switch to 7½ ips (19 cm/s). (4) Adjust R234 to obtain the same output at both 400 Hz and 10 kHz. (5) Set the TAPE SPEED switch to 3¾ ips (9.5 cm/s). (6) Adjust R237 to obtain the same output at both 400 Hz and 10 kHz. (7) Set the PB HEAD selector switch to "4". (8) Make sure that the frequency response is the same as in steps 4 and 6.
3. VU Meter Calibration	1 kHz of –60 dB (0.78 mV) to MIC jack		Record	R230 (Both L-CH and R-CH) (See Fig. 4-2-4)	(1) Set the MONITOR switch to SOURCE. (2) Set the MIC volume control VR401-1 (VR401-2) to obtain 0 dB (0.775 V) on the VTVM. (3) Adjust R230 so that the pointer of VU meter stays at OVU.
4. Record Bias Adjustment	1 kHz of –10 dB (0.245 V) to LINE IN jack		Record	C311 (L-CH) ..... 30~200 pF C312 (R-CH) ..... 30~200 pF (See Fig. 4-2-4)	(1) Set the MONITOR switch to TAPE. (2) Turn C311 (C312) clockwise to the full and return it several times. (3) Trun C311 (C312) clockwise slowly to obtain the maximum output on the VTVM. (4) Turn C311 (C312) farther clockwise to obtain the level 0.5 dB less from the maximum.
5. Record Head Azimuth Adjustment	5 kHz of –20 dB (77.5 mV) to LINE IN jack	Same as Item 4	Record	Azimuth Adjusting Screws (See Fig. 4-2-3)	(1) Set the TAPE SPEED switch to 3¾ ips (9.5 cm/s). (2) Set the MONITOR switch to TAPE. (3) Adjust for maximum reading on the VTVM. **Note:** When the same level cannot be obtained at both channels, take the middle between the two positions of the screw in the maximum output levels. The difference between the two levels should be within 2.5 dB.
6. Record Level Adjustment	1 kHz of –10 dB (0.245 V) to LINE IN jack	Same as Item 4	Record	R125 (Both L-CH and R-CH) (See Fig. 4-2-4)	(1) Set the MONITOR switch to SOURCE. (2) Adjust the LINE volume control VR402-1 (VR402-2) to obtain 0 dB (0.775 V) on the VTVM. (3) Set the MONITOR switch to TAPE. (4) Adjust R125 to obtain 0 dB on the VTVM.
7. Dummy Coil Adjustment	10 kHz of –30 dB (24.5 mV) to LINE IN jack	Same as Item 4	Record	L303 (R-CH) and L304 (L-CH) (See Fig. 4-2-4)	(1) Set the MONITOR switch to TAPE. (2) Make a note of the output levels on the VTVM in the stereo record mode. (3) Adjust L304 (L303) so that the levels in the monaural record mode are the same as those in stereo record mode.
8. Record Equalizer Adjustment	1 kHz and 10 kHz of –20 dB (77.5 mV) to LINE IN jack	Same as Item 4	Record	L101 (Both L-CH and R-CH) ... with an SLH tape L102 (Both L-CH and R-CH) ... with a standard tape (See Fig. 4-2-4)	(1) Set the TAPE SPEED switch to 3¾ ips (9.5 cm/s). (2) Set the MONITOR switch to TAPE. (3) Thread an SLH tape onto the unit. (4) Set the TAPE SELECTOR switch to SPECIAL. (5) Record 1 kHz signal, and make a note of the playback output level on the VTVM. (6) Record 10 kHz signal. (7) Adjust L101 so that the difference between the two output levels is within ±2 dB. (8) Thread a standard tape onto the unit, and set the TAPE SELECTOR switch to NORMAL. (9) Proceed as in the steps from 5 to 7. Adjust L102 for the correct levels. (10) Perform the same adjustment with the TAPE SPEED switch set to 7½ ips (19 cm/s) and to 15 ips (38 cm/s). The correct values are as follows: NORMAL SPECIAL 15 ips (38 cm/s) : 30~20 kHz 30~25 kHz 7½ ips (19 cm/s) : 30~15 kHz 30~22 kHz } ±2 dB 3¾ ips (9.5 cm/s) : 50~10 kHz 50~12 kHz

SECTION 5
DIAGRAMS

5-1. SCHEMATIC DIAGRAM

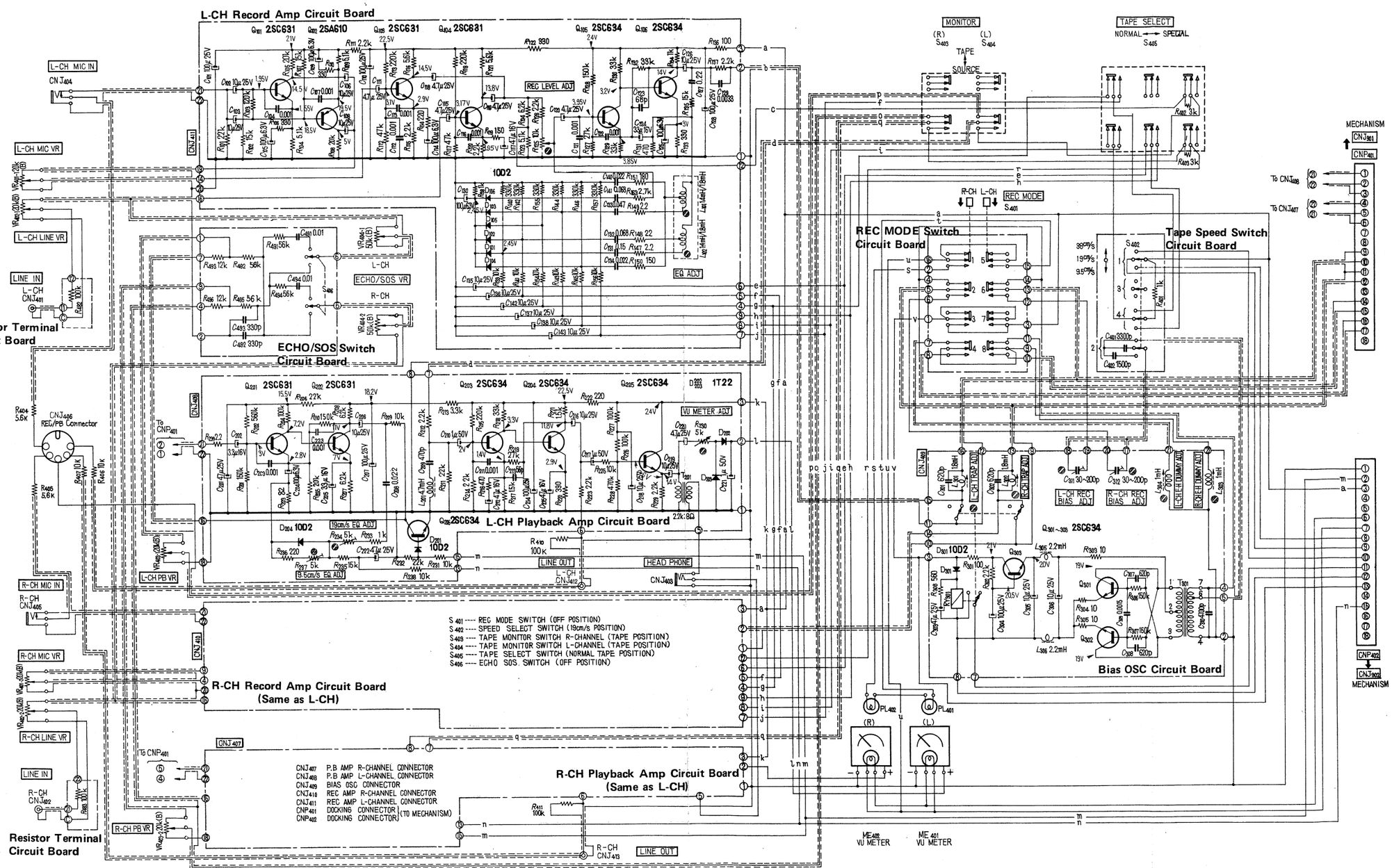
5-1-1. System Control Circuit



Notes:

1. All resistors and capacitors are rated in Ω and μF, unless otherwise specified.
2. Voltages shown are measured to ground by using a voltmeter (20kΩ/V) with no signal input in STOP mode.
   All voltages may vary slightly due to normal component tolerances, etc.

5-1-2. Audio Amp. and Bias OSC Circuit


L-CH Record Amp Circuit Board
L-CH MIC IN
L-CH MIC VR
L-CH LINE VR
LINE IN
Resistor Terminal Circuit Board
ECHO/SOS Switch Circuit Board
REC LEVEL ADJ
EQ ADJ
VU METER ADJ
L-CH Playback Amp Circuit Board
L-CH PB VR
HEAD PHONE
LINE OUT
R-CH MIC IN
R-CH MIC VR
R-CH LINE VR
R-CH Record Amp Circuit Board (Same as L-CH)
R-CH Playback Amp Circuit Board (Same as L-CH)
R-CH PB VR
Resistor Terminal Circuit Board
CNJ406 REC/PB Connector
MONITOR
TAPE SOURCE
TAPE SELECT
NORMAL SPECIAL
REC MODE Switch Circuit Board
Tape Speed Switch Circuit Board
L-CH REC BIAS ADJ
R-CH REC BIAS ADJ
L-CH TRAP ADJ
R-CH TRAP ADJ
L-CH DUMMY ADJ
R-CH DUMMY ADJ
Bias OSC Circuit Board
MECHANISM
S401 ---- REC MODE SWITCH (OFF POSITION)
S402 ---- SPEED SELECT SWITCH (19cm/s POSITION)
S403 ---- TAPE MONITOR SWITCH R-CHANNEL (TAPE POSITION)
S404 ---- TAPE MONITOR SWITCH L-CHANNEL (TAPE POSITION)
S405 ---- TAPE SELECT SWITCH (NORMAL TAPE POSITION)
S406 ---- ECHO SOS SWITCH (OFF POSITION)
CNJ407 P.B AMP R-CHANNEL CONNECTOR
CNJ408 P.B AMP L-CHANNEL CONNECTOR
CNJ409 BIAS OSC CONNECTOR
CNJ410 REC AMP R-CHANNEL CONNECTOR
CNJ411 REC AMP L-CHANNEL CONNECTOR
CNP401 DOCKING CONNECTOR (TO MECHANISM)
CNP402 DOCKING CONNECTOR
ME402 VU METER
ME401 VU METER

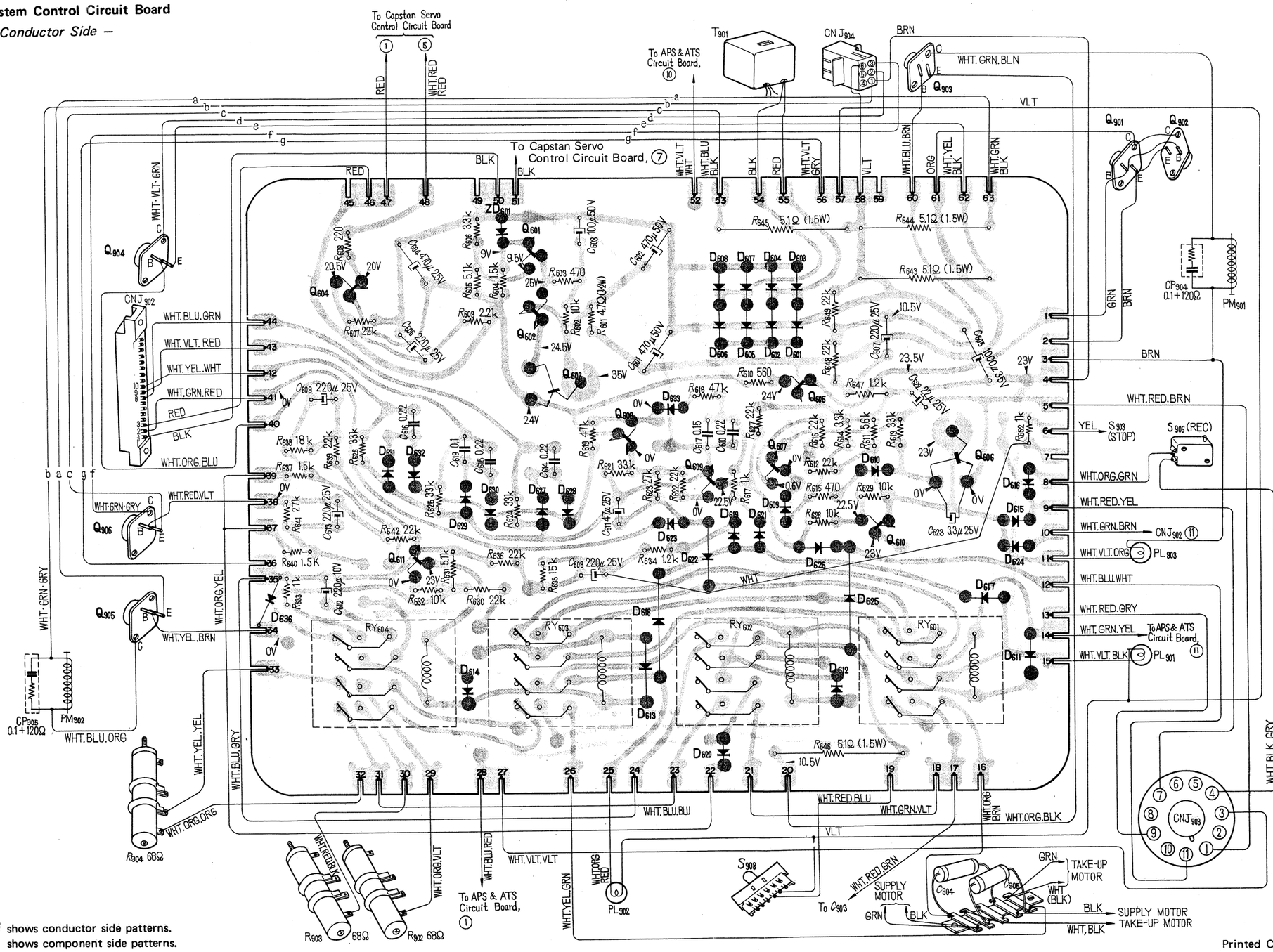
Notes:

1. All resistors and capacitors are rated in Ω and μF, unless otherwise specified.
2. Voltages shown are measured to ground by using a voltmeter (20 kΩ/V) with no signal input in record mode.
   All voltages may vary slightly due to normal component tolerances, etc.
3. ◐ : adjustable

5-2. MOUNTING DIAGRAM

5-2-1. System Control Circuit Board

– Conductor Side –

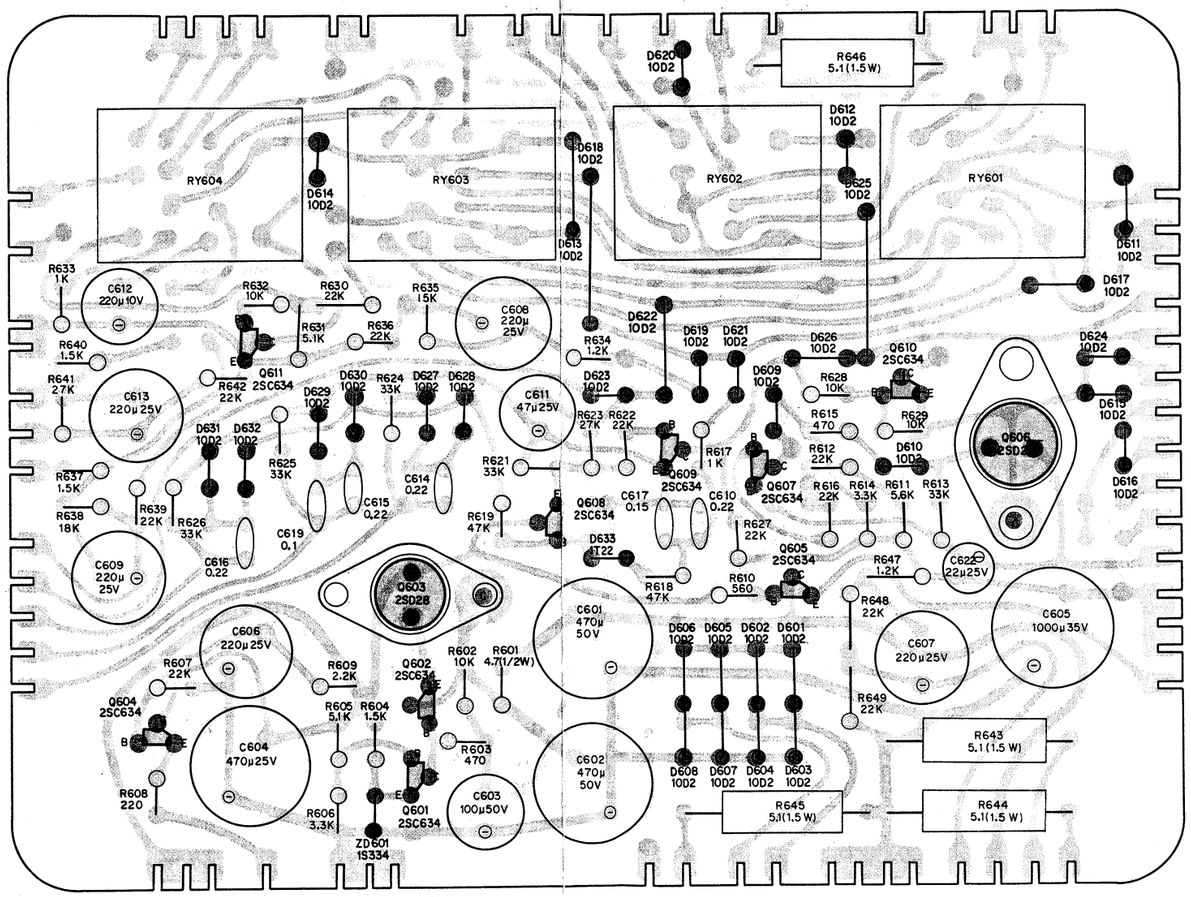


Note:

shows conductor side patterns.
shows component side patterns.

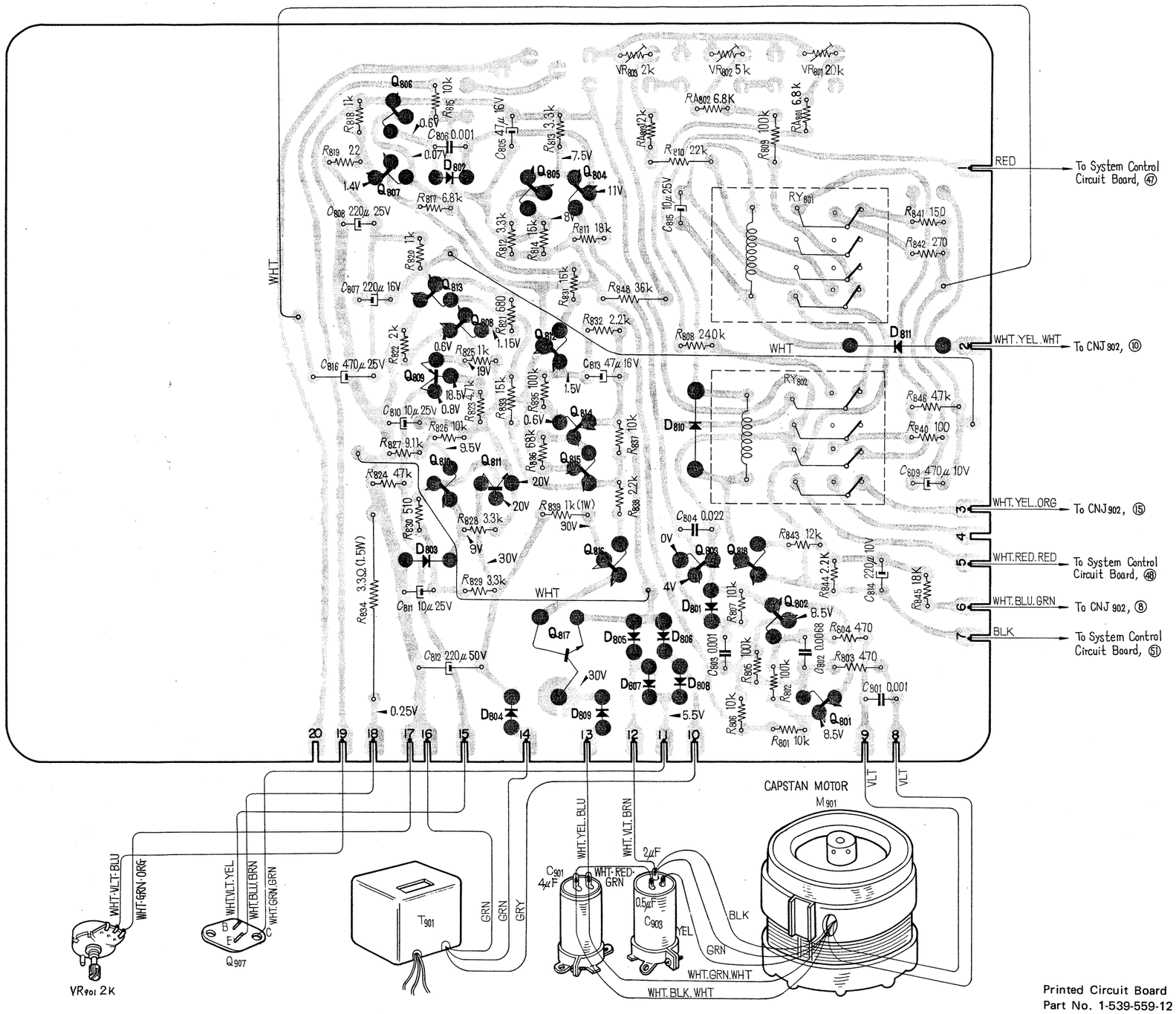
Printed Circuit Board
Part No. 1-539-561-12

– Component Side –



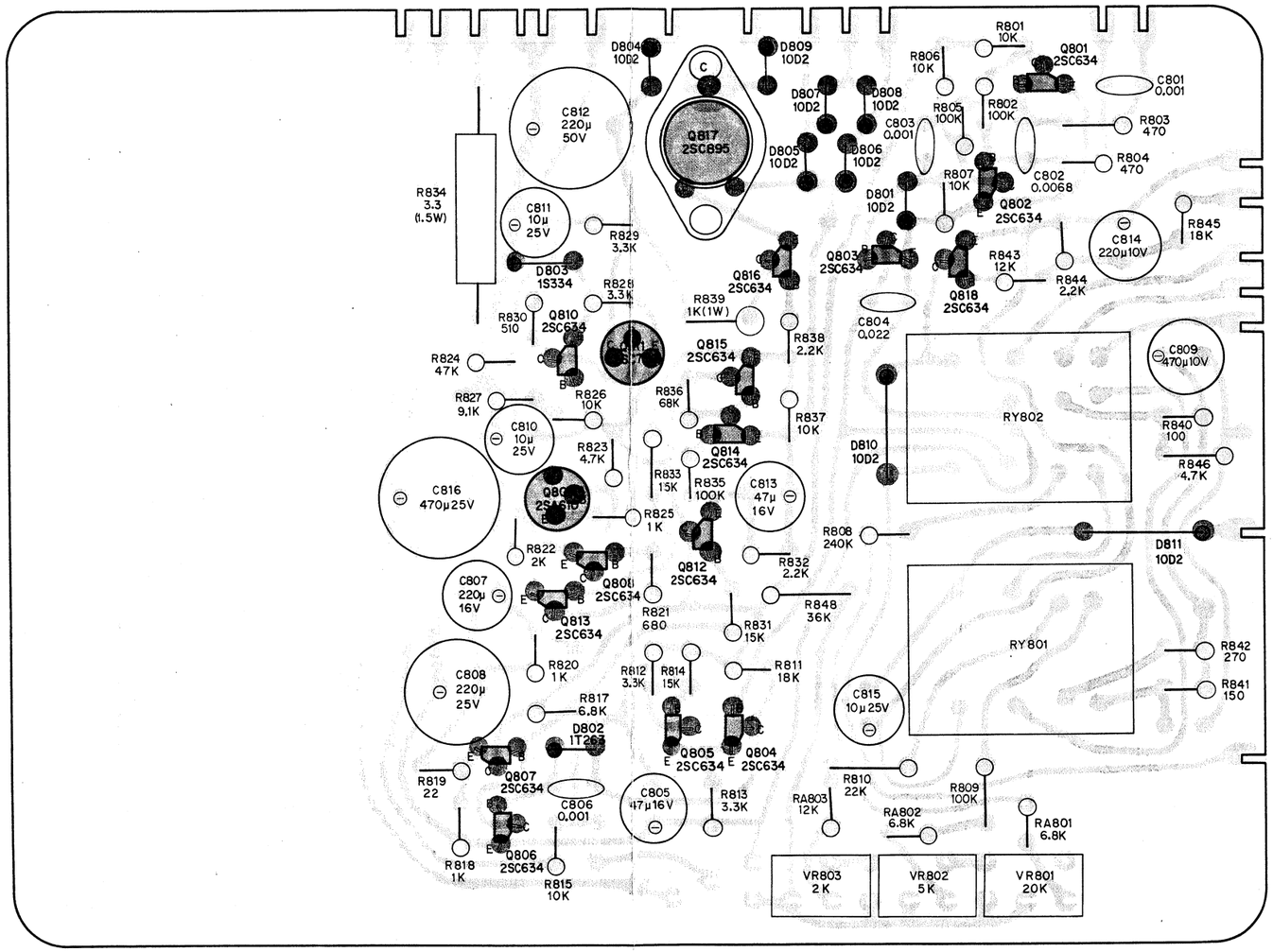
5-2-2. Capstan Servo Control Circuit Board

– Conductor Side –



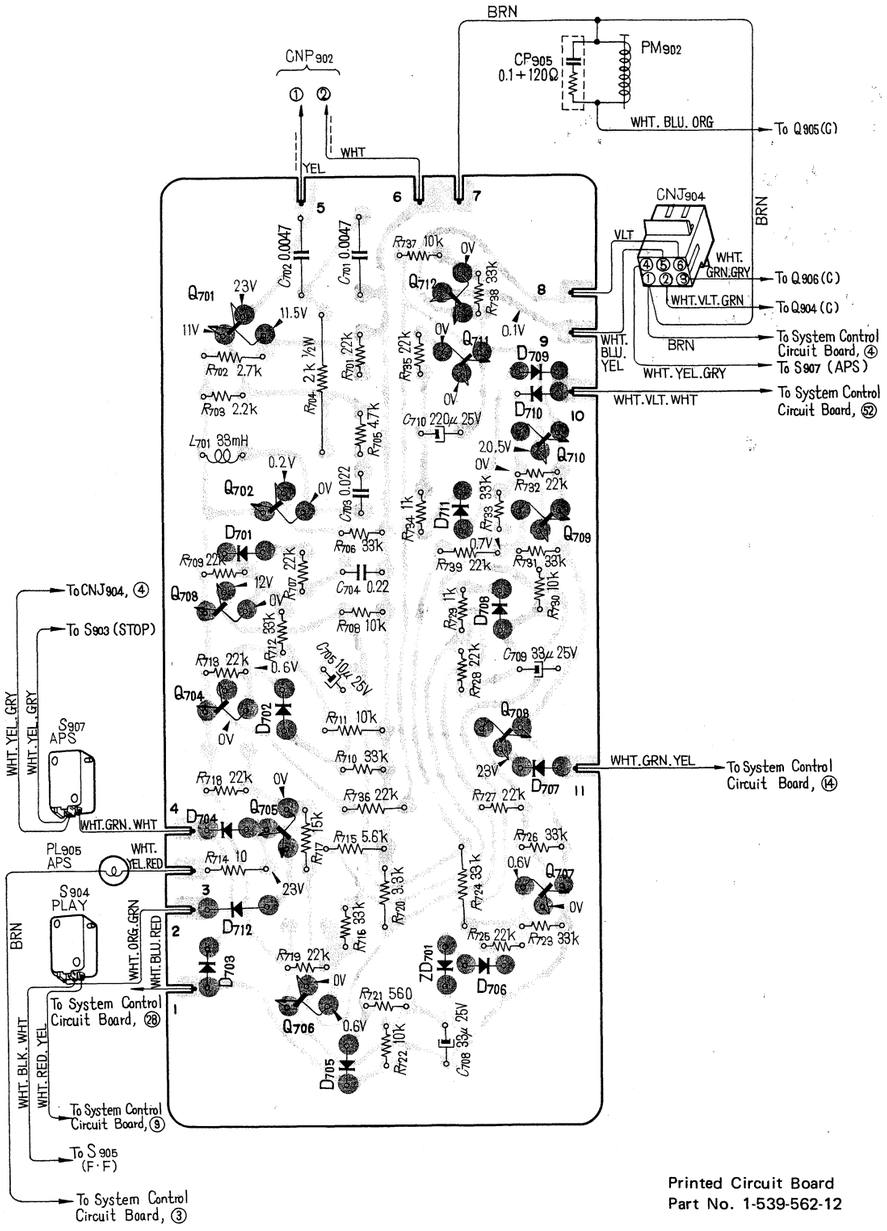
Printed Circuit Board
Part No. 1-539-559-12

– Component Side –



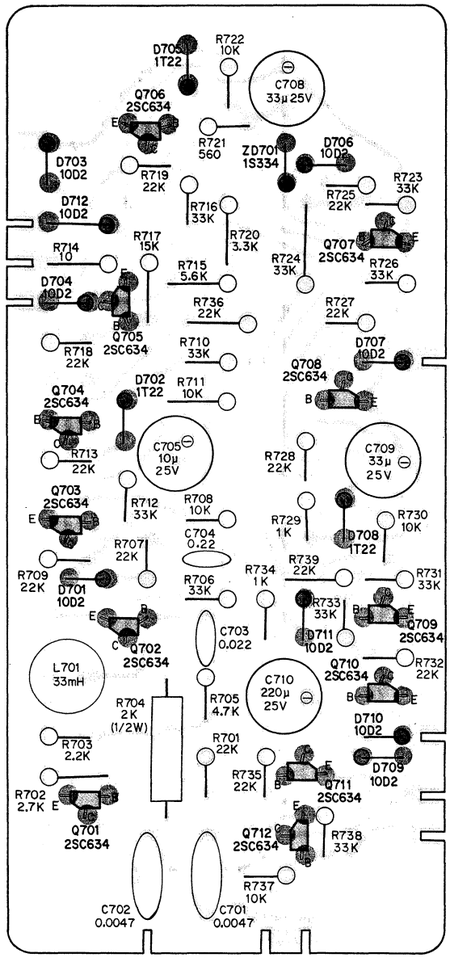
5-2-3. APS and ATS Circuit Board

– Conductor Side –



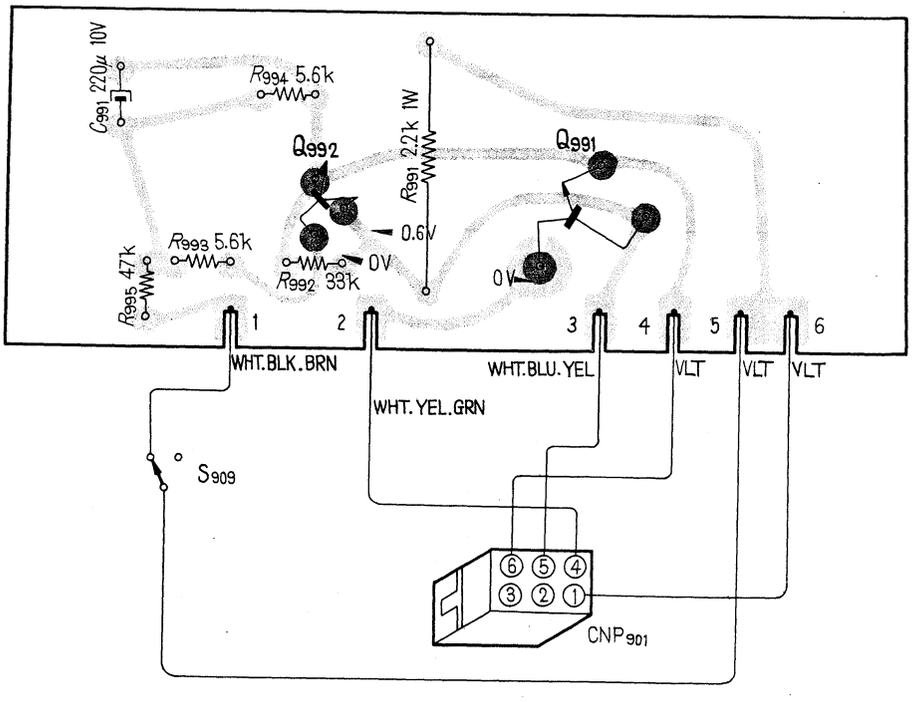
Printed Circuit Board
Part No. 1-539-562-12

– Component Side –



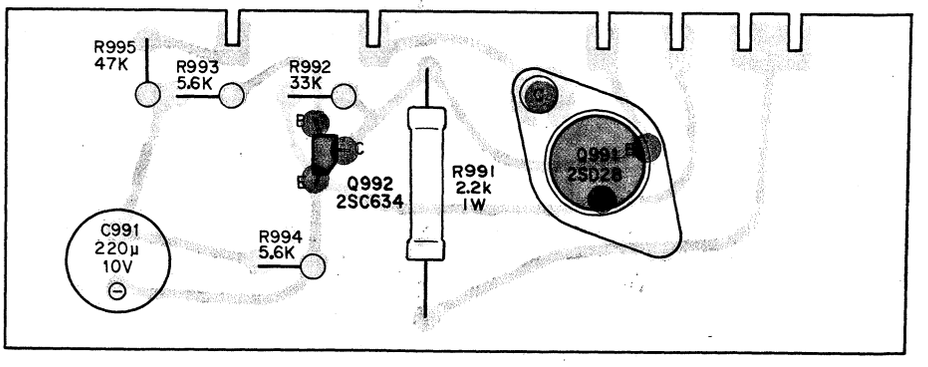
5-2-4. SHUT-OFF Switch Circuit Board

– Conductor Side –



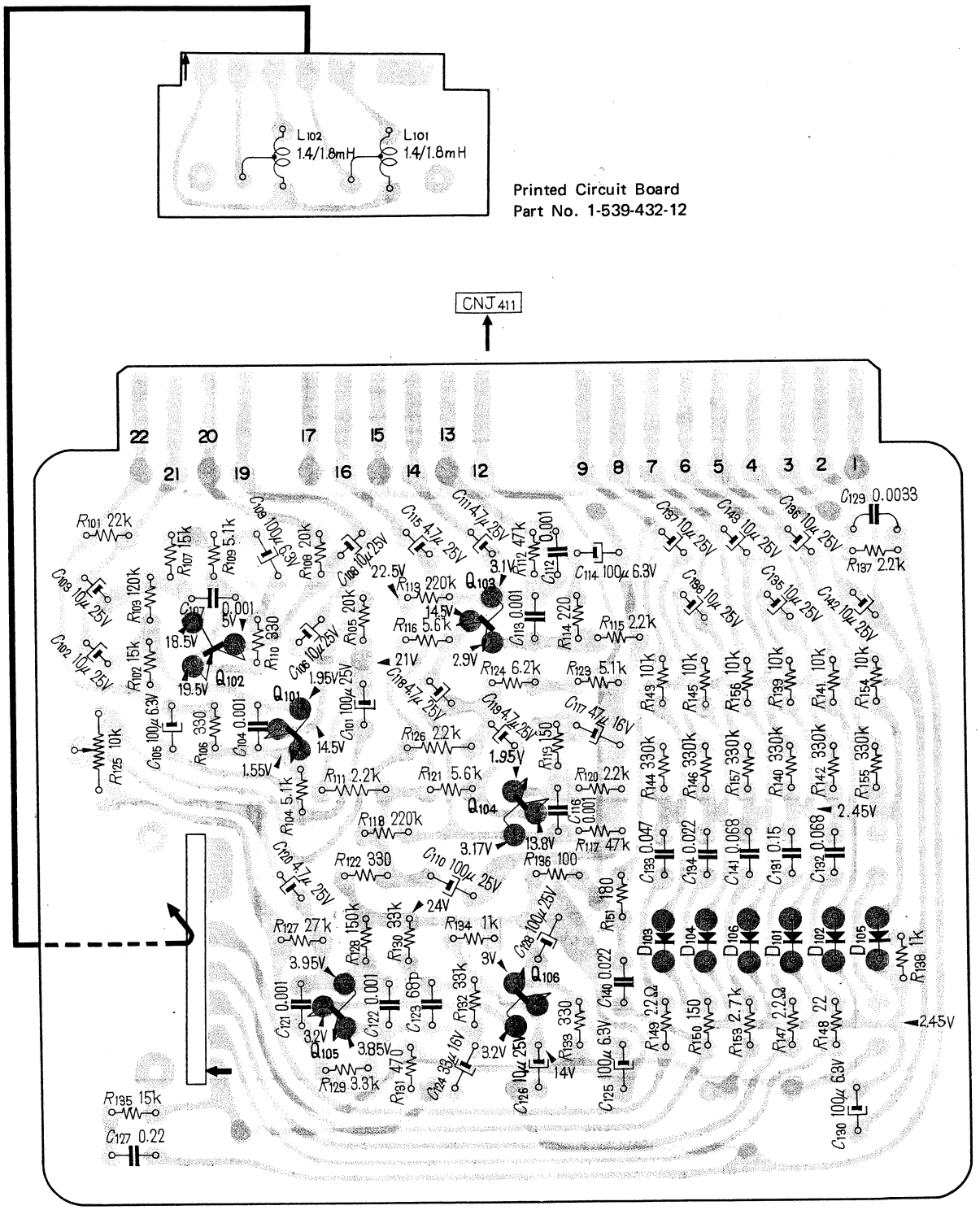
Printed Circuit Board
Part No. 1-539-588-11

– Component Side –



5-2-5. Record Amp. Circuit Board

– Conductor Side –



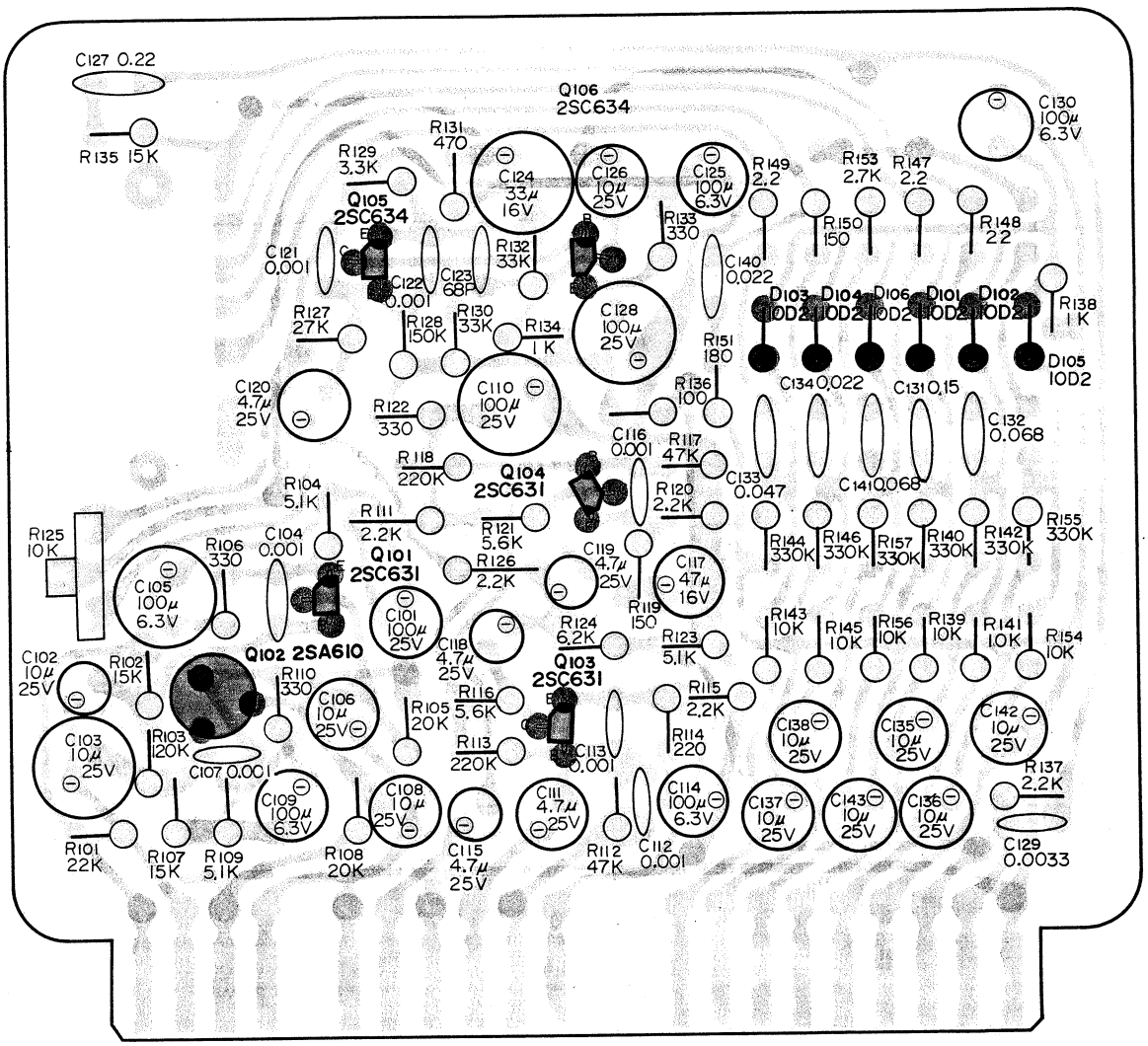
Printed Circuit Board
Part No. 1-539-432-12

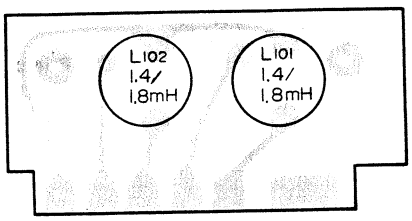
Printed Circuit Board
Part No. 1-539-431-14

Note:

shows conductor side patterns.
shows component side patterns.

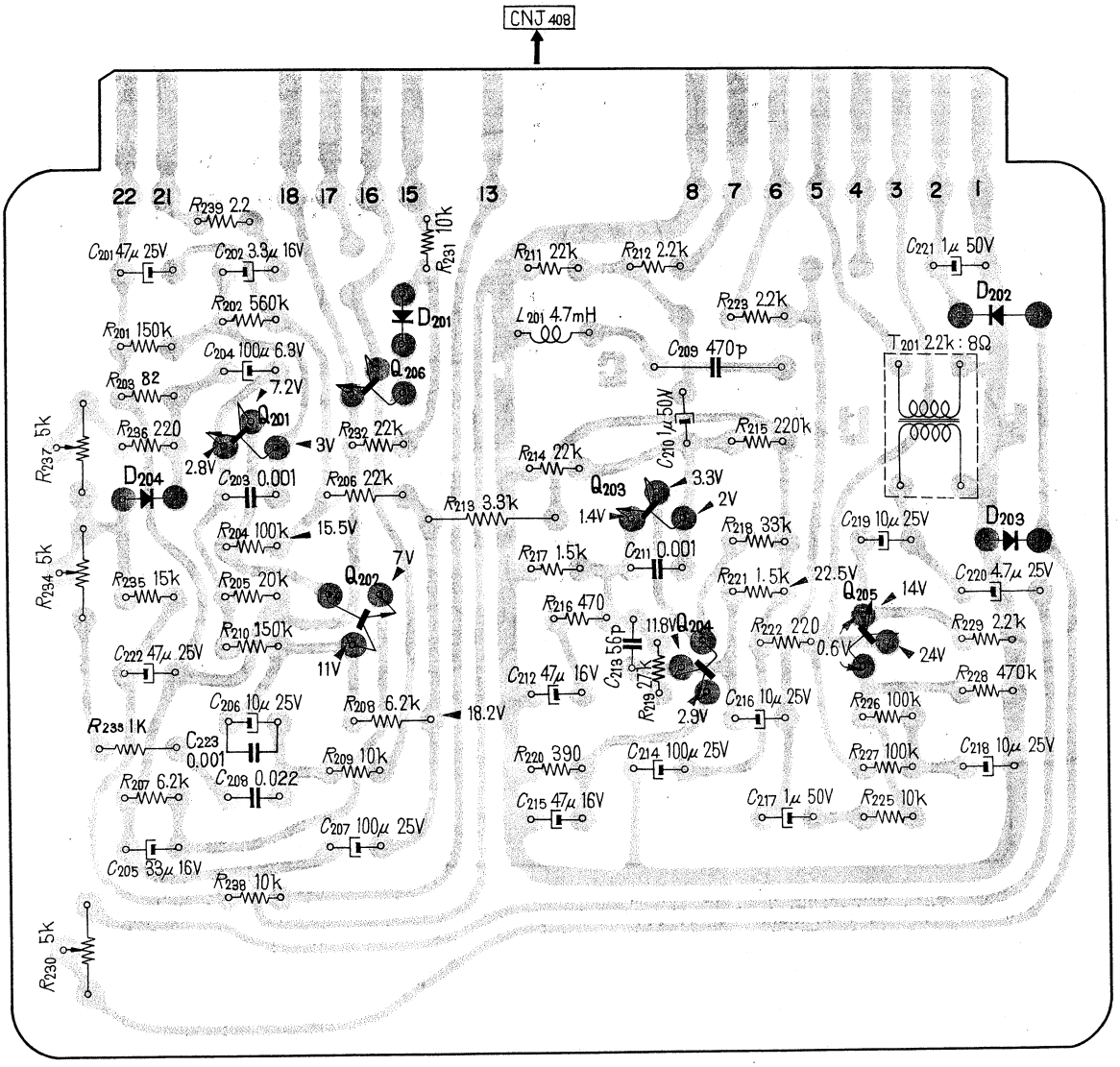
— Component Side —





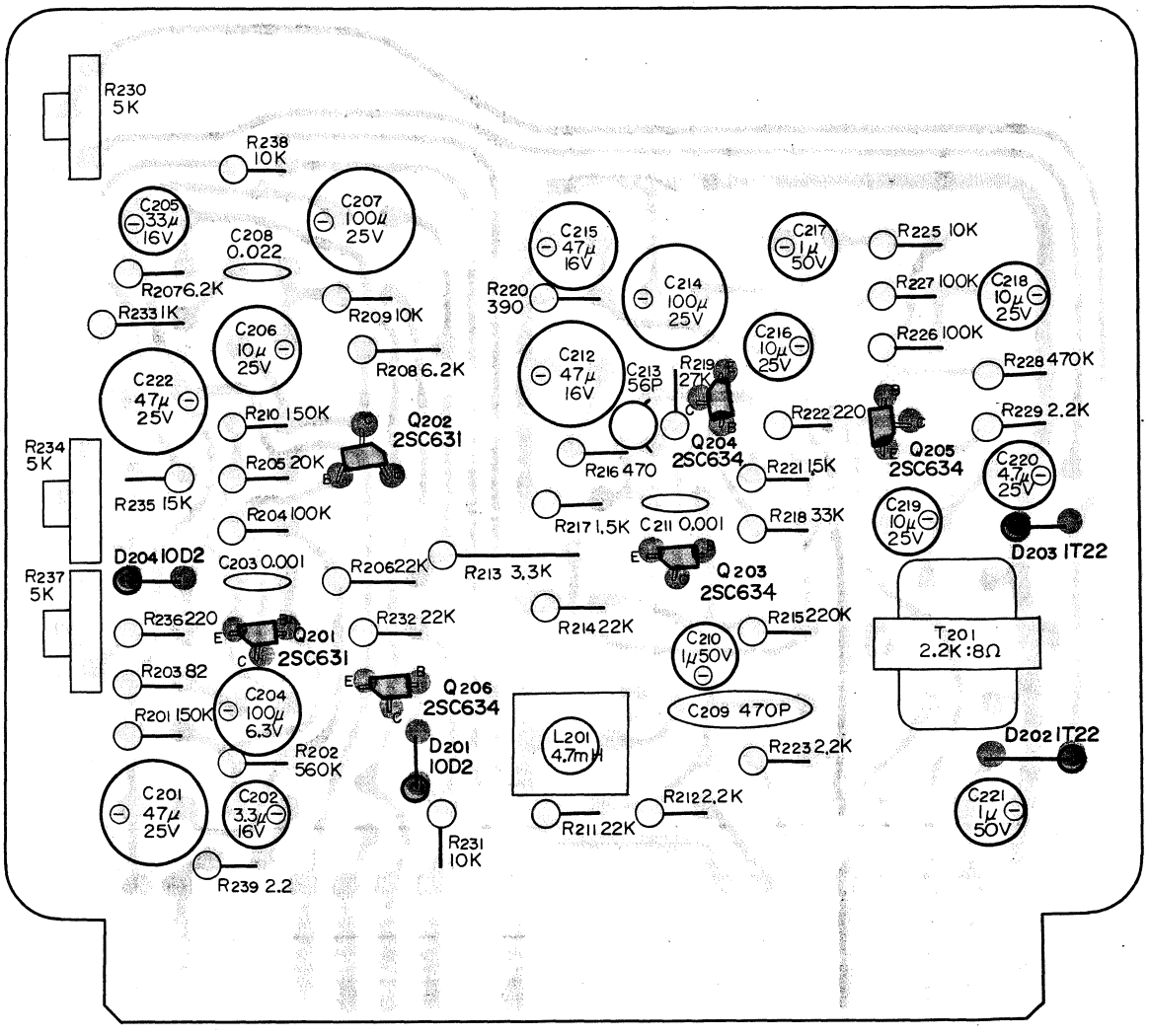
5-2-6. Playback Amp. Circuit Board

– Conductor Side –



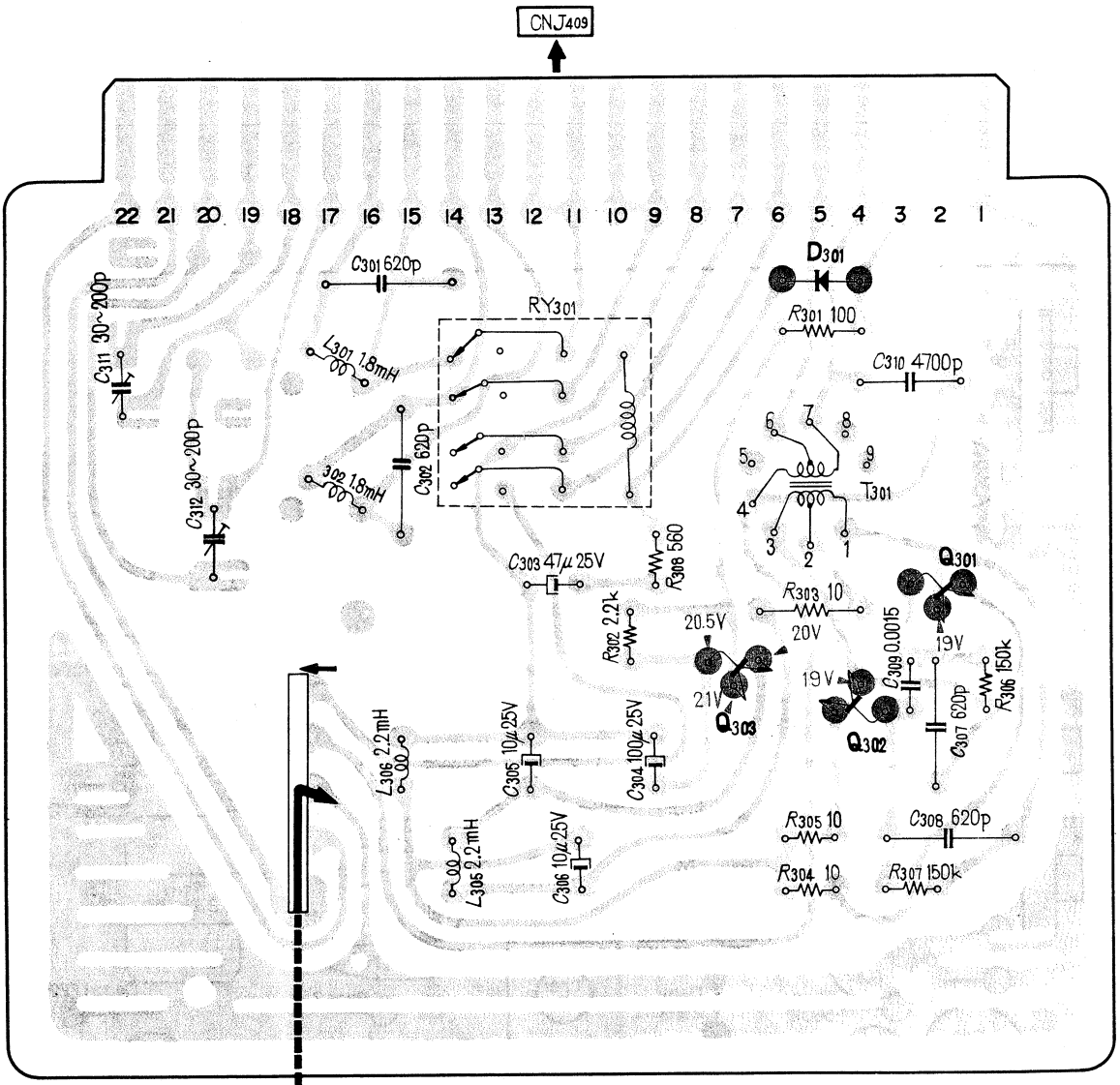
Printed Circuit Board
Part No. 1-539-444-13

— Component Side —

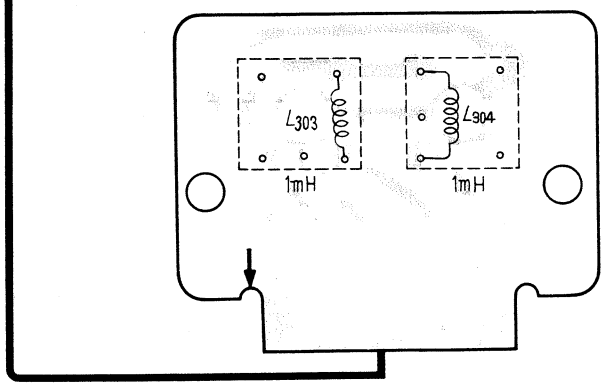


5-2-7. Bias OSC Circuit Board

– Conductor Side –

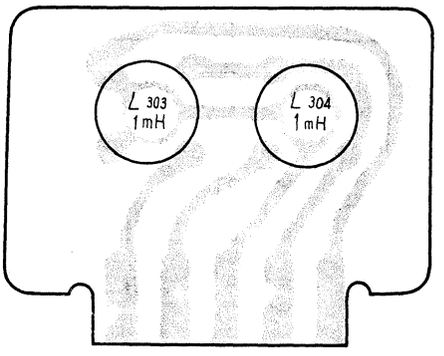


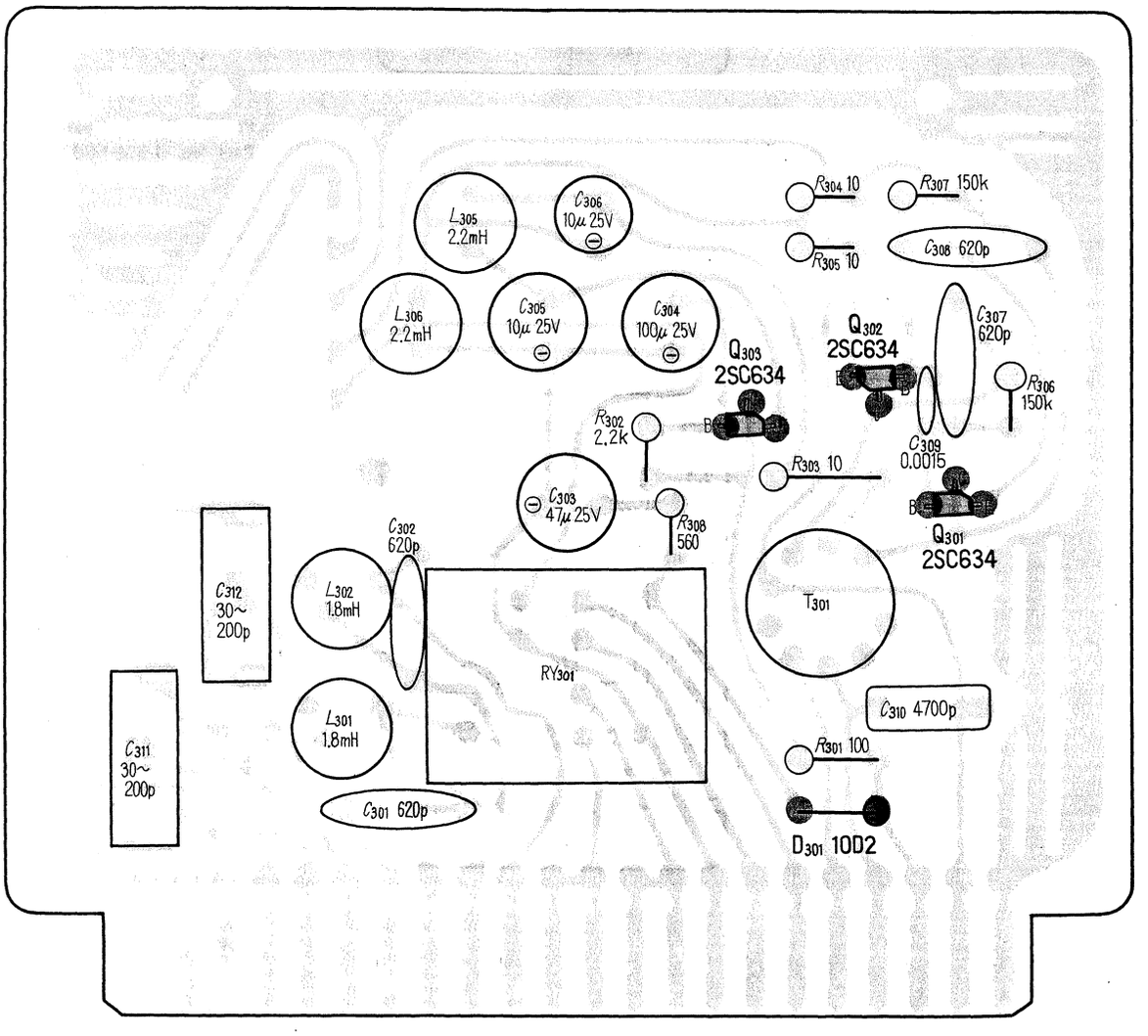
Printed Circuit Board
Part No. 1-539-558-12



Printed Circuit Board
Part No. 1-539-563-12

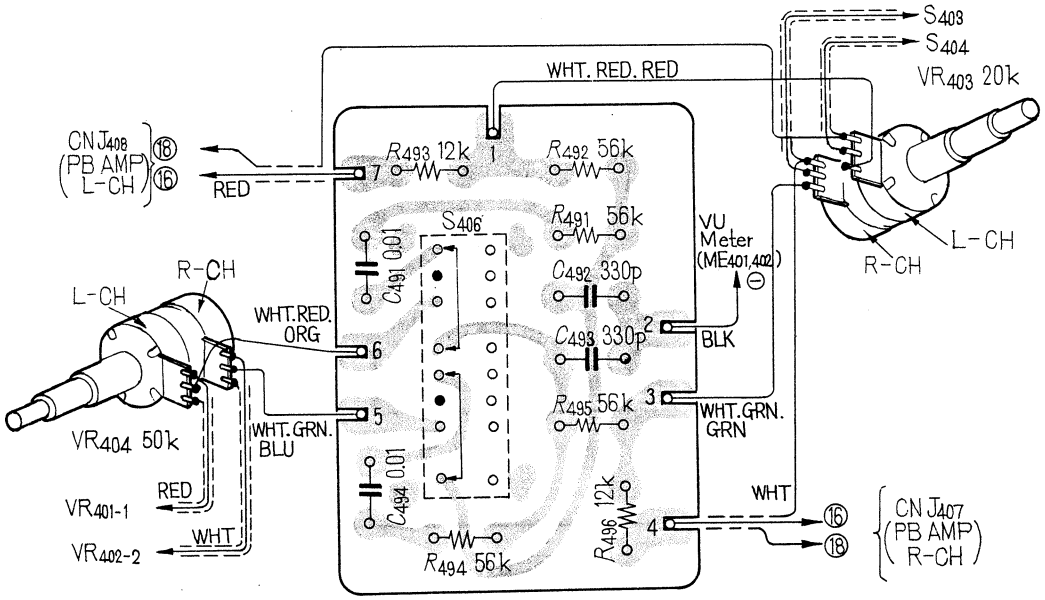
— Component Side —





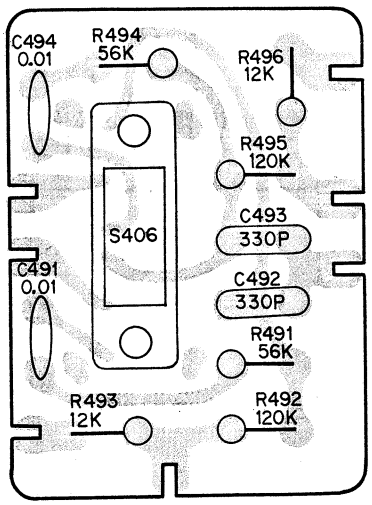
5-2-8. ECHO/SOS Switch Circuit Board

— Conductor Side —



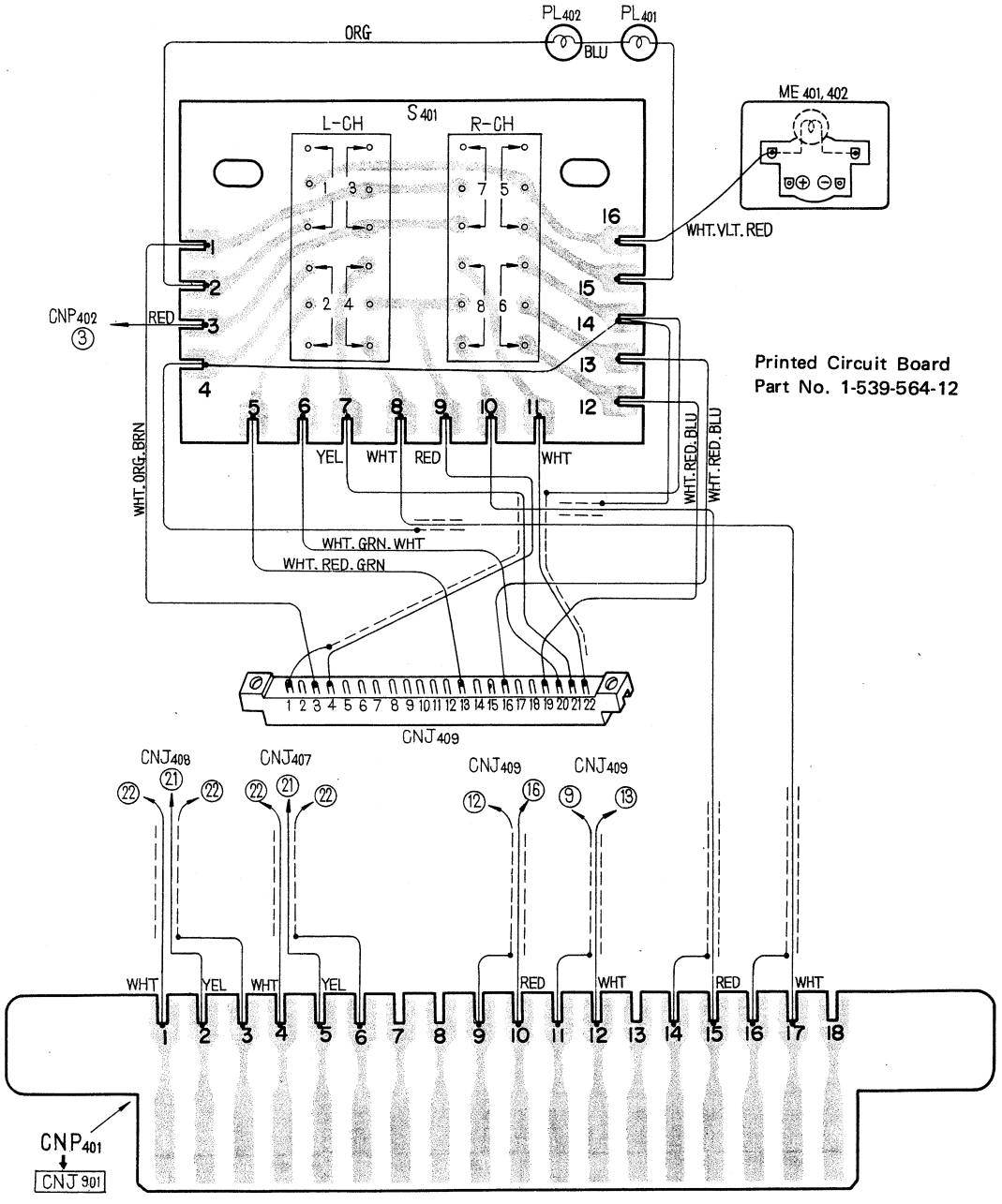
Printed Circuit Board
Part No. 1-539-560-11

— Component Side —



5-2-9. REC MODE Switch Circuit Board

– Conductor Side –

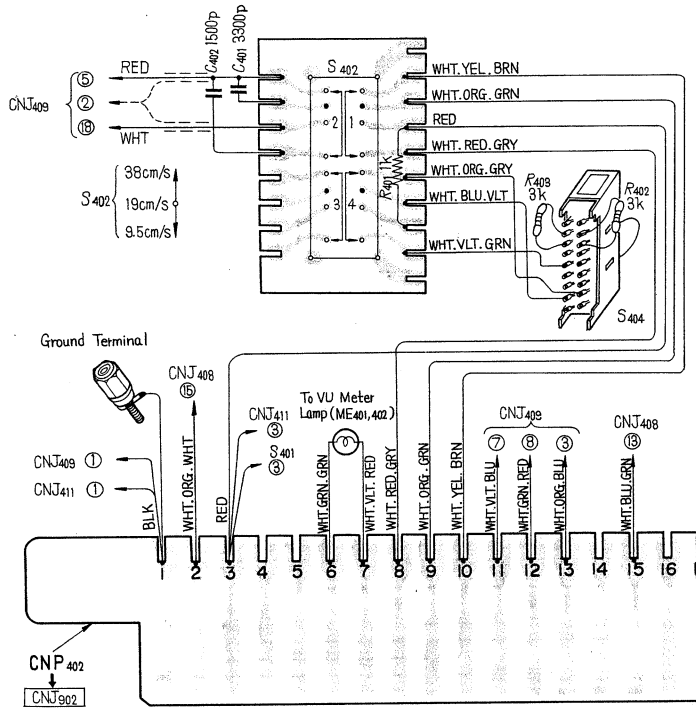


Printed Circuit Board
Part No. 1-539-564-12

Printed Circuit Board
Part No. 1-539-567-11

5-2-10. Tape Speed Switch Circuit Board

– Conductor Side –

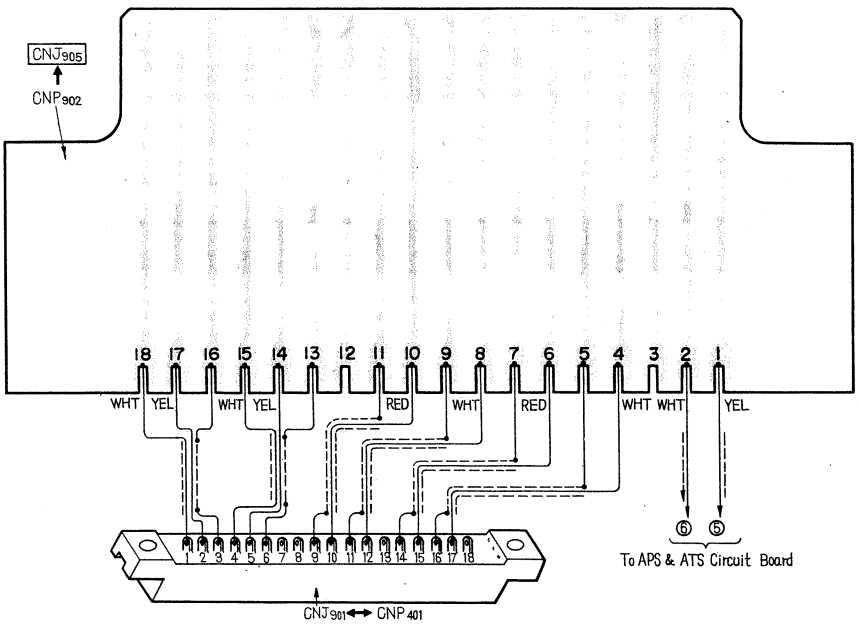


Printed Circuit Board
Part No. 1-539-443-12

Printed Circuit Board
Part No. 1-539-567-11

5-2-11. Head Connector Circuit Board

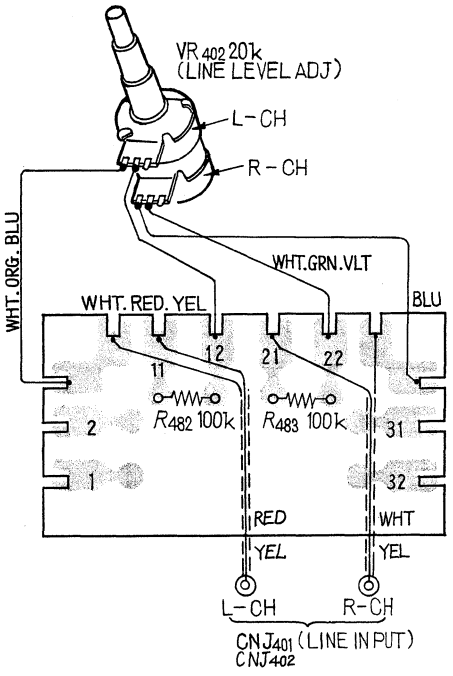
– Conductor Side –



Printed Circuit Board
Part No. 1-539-566-11

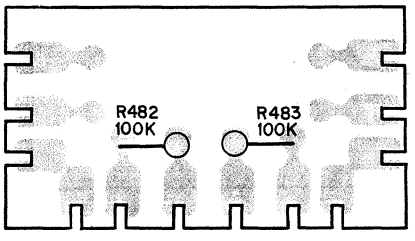
5-2-12. Resistor Terminal Circuit Board

– Conductor Side –



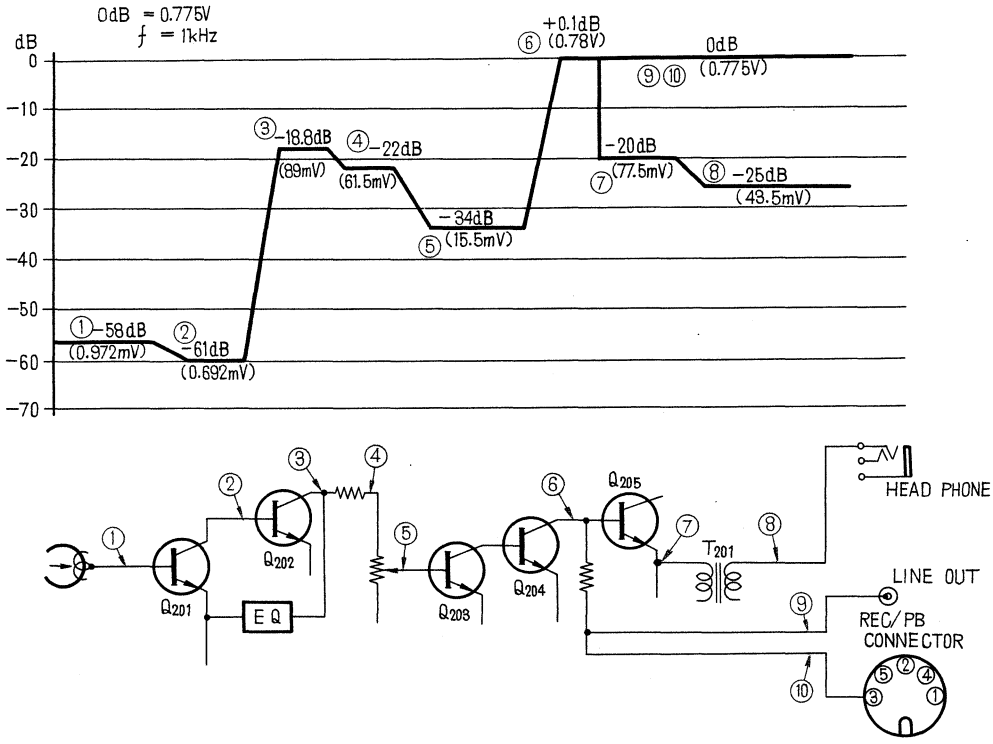
Printed Circuit Board
Part No. 1-539-435-12

– Component Side –

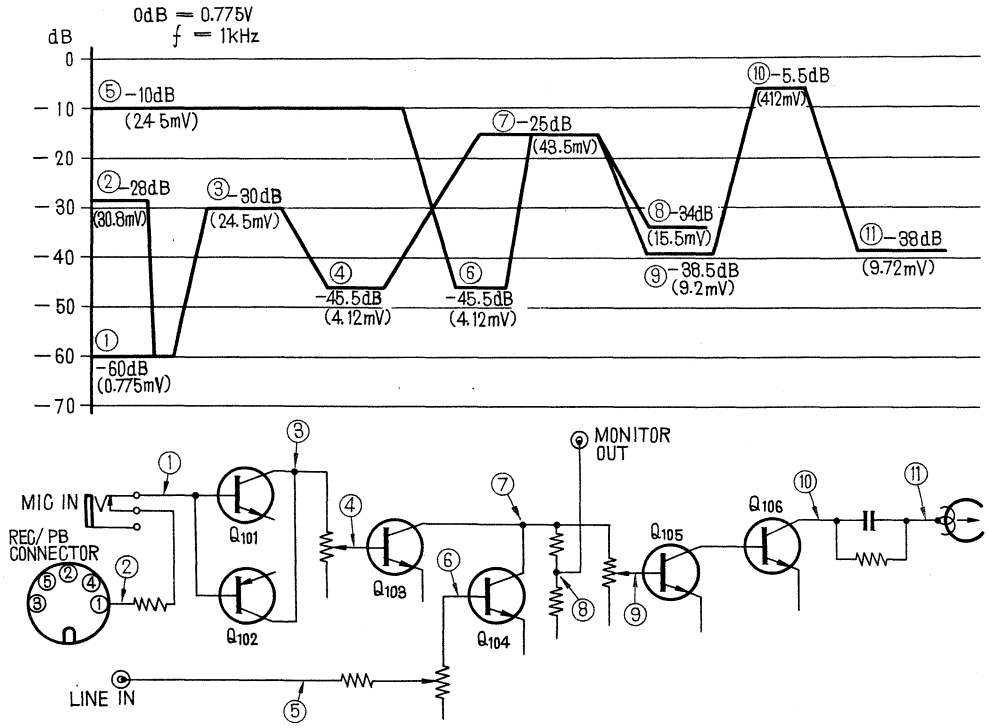


5-3. LEVEL DIAGRAM

Playback

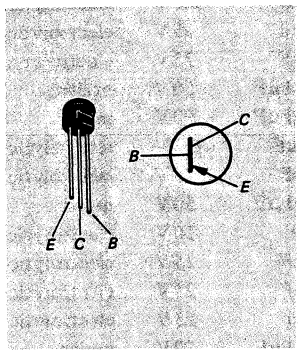


Record

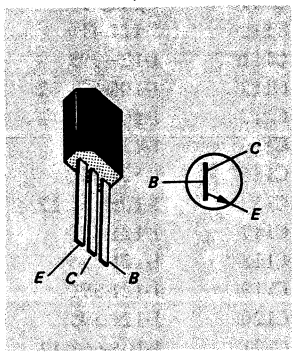


SECTION 6
SEMICONDUCTOR ELECTRODES

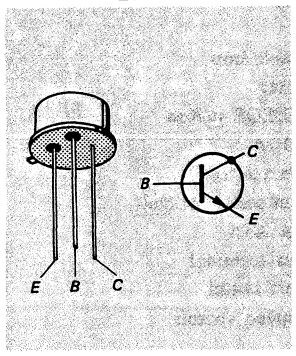
Transistor
2SA610



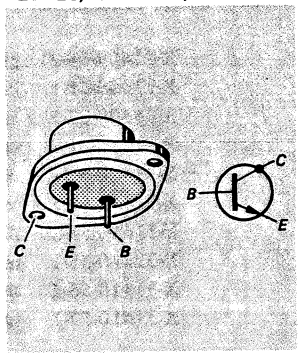
2SC631, 2SC634



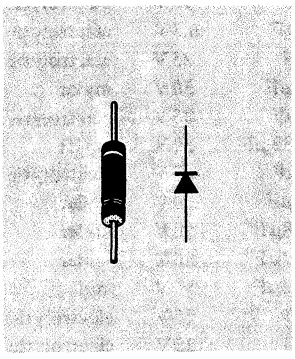
2SC756



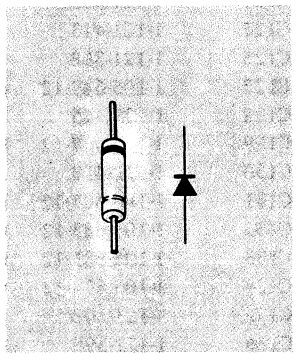
2SD28, 2SC807A, 2SC895



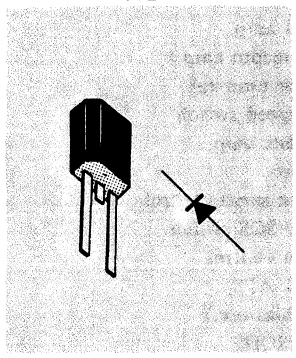
Diode
1S334



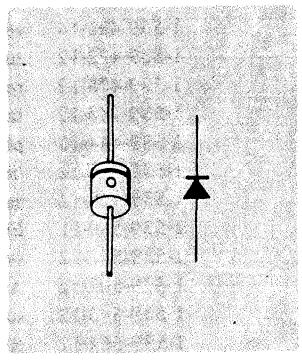
1T22



1T263



10D2



SECTION 7
ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description

MOUNTED CIRCUIT BOARDS

X-31409-54-21	playback amp.
X-31409-61-1	bias osc.
X-31409-65-1	ECHO/SOS switch
X-31410-51-2	record amp.
X-31410-52-2	system control
X-31410-53-2	capstan servo control
X-31410-54-2	APS & ATS
X-31410-55-1	resistor terminal
X-31410-56-2	shut-off switch
X-31410-57-1	tape speed switch

PRINTED CIRCUIT BOARDS

1-539-431-14	record amp.
1-539-432-12	sub. (record amp.)
1-539-435-12	resistor terminal
1-539-443-12	tape speed switch
1-539-444-13	playback amp.
1-539-558-12	bias osc.
1-539-559-12	capstan servo control
1-539-560-11	ECHO/SOS switch
1-539-561-12	system control
1-539-562-12	APS & ATS
1-539-563-12	sub. (bias osc.)
1-539-564-12	REC MODE
1-539-566-11	head connector, CNP902
1-539-567-11	docking, CNP401, 402
1-539-588-11	shut-off switch

RECORD AMP CIRCUIT

SEMICONDUCTORS

Q101	transistor,	2SC631
Q102	transistor,	2SA610
Q103	transistor,	2SC631
Q104	transistor,	2SC631
Q105	transistor,	2SC634
Q106	transistor,	2SC634
D101–106	diode,	10D2

COILS

L101	1-231-069	equalizer, 1.4/1.8 mH
L102	1-231-069	equalizer, 1.4/1.8 mH

CAPACITORS

C101	1-121-416	100μF	25V	electrolytic
C102	1-121-398	10μF	25V	electrolytic
C103	1-121-398	10μF	25V	electrolytic
C104	1-105-661-12	0.001μF	50V	mylar
C105	1-121-413	100μF	6.3V	electrolytic
C106	1-121-398	10μF	25V	electrolytic
C107	1-105-661-12	0.001μF	50V	mylar
C108	1-121-398	10μF	25V	electrolytic
C109	1-121-413	100μF	6.3V	electrolytic
C110	1-121-416	100μF	25V	electrolytic
C111	1-121-395	4.7μF	25V	electrolytic
C112	1-105-661-12	0.001μF	50V	mylar
C113	1-105-661-12	0.001μF	50V	mylar
C114	1-121-413	100μF	6.3V	electrolytic
C115	1-121-395	4.7μF	25V	electrolytic
C116	1-105-661-12	0.001μF	50V	mylar
C117	1-121-409	47μF	16V	electrolytic
C118	1-121-395	4.7μF	25V	electrolytic
C119	1-121-395	4.7μF	25V	electrolytic
C120	1-121-395	4.7μF	25V	electrolytic
C121	1-105-661-12	0.001μF	50V	mylar
C122	1-105-661-12	0.001μF	50V	mylar
C123	1-107-127	68pF	50V	silvered mica
C124	1-121-403	33μF	16V	electrolytic
C125	1-121-413	100μF	6.3V	electrolytic
C126	1-121-398	10μF	25V	electrolytic
C127	1-105-689-12	0.22μF	50V	mylar
C128	1-121-416	100μF	25V	electrolytic
C129	1-105-667-12	0.0033μF	50V	mylar
C130	1-121-413	100μF	6.3V	electrolytic
C131	1-105-687-12	0.15μF	50V	mylar
C132	1-105-683-12	0.068μF	50V	mylar
C133	1-105-681-12	0.047μF	50V	mylar
C134	1-105-677-12	0.022μF	50V	mylar
C135	1-121-398	10μF	25V	electrolytic
C136	1-121-398	10μF	25V	electrolytic
C137	1-121-398	10μF	25V	electrolytic
C138	1-121-398	10μF	25V	electrolytic
C139		– discarded –		
C140	1-105-677-12	0.022μF	50V	mylar
C141	1-105-683-12	0.068μF	50V	mylar
C142	1-121-398	10μF	25V	electrolytic
C143	1-121-398	10μF	25V	electrolytic

RESISTORS

All resistors are ¼W and carbon type, unless otherwise indicated.

R101	1-242-705	22kΩ
R102	1-242-701	15kΩ
R103	1-242-723	120kΩ
R104	1-242-690	5.1kΩ
R105	1-242-704	20kΩ
R106	1-242-661	330Ω
R107	1-242-701	15kΩ
R108	1-242-704	20kΩ
R109	1-242-690	5.1kΩ
R110	1-242-661	330Ω
R111	1-242-681	2.2kΩ
R112	1-242-713	47kΩ
R113	1-242-729	220kΩ
R114	1-242-657	220Ω
R115	1-242-681	2.2kΩ
R116	1-242-691	5.6kΩ
R117	1-242-713	47kΩ
R118	1-242-729	220kΩ

Ref. No.	Part No.		Description
R119	1-242-653	150Ω	
R120	1-242-681	2.2kΩ	
R121	1-242-691	5.6kΩ	
R122	1-242-661	330Ω	
R123	1-242-690	5.1kΩ	
R124	1-242-692	6.2kΩ	
R125	1-221-383	10kΩ (B)	semi-fixed
R126	1-242-681	2.2kΩ	
R127	1-242-707	27kΩ	
R128	1-242-725	150kΩ	
R129	1-242-685	3.3kΩ	
R130	1-242-709	33kΩ	
R131	1-242-665	470Ω	
R132	1-242-709	33kΩ	
R133	1-242-661	330Ω	
R134	1-242-673	1kΩ	
R135	1-242-701	15kΩ	
R136	1-242-649	100Ω	
R137	1-242-681	2.2kΩ	
R138	1-242-673	1kΩ	
R139	1-242-697	10kΩ	
R140	1-242-733	330kΩ	
R141	1-242-697	10kΩ	
R142	1-242-733	330kΩ	
R143	1-242-697	10kΩ	
R144	1-242-733	330kΩ	
R145	1-242-697	10kΩ	
R146	1-242-733	330kΩ	
R147	1-242-609	2.2Ω	
R148	1-242-633	22Ω	
R149	1-242-609	2.2Ω	
R150	1-242-663	150Ω	
R151	1-242-655	180Ω	
R152		– discarded –	
R153	1-242-683	2.7kΩ	
R154	1-242-697	10kΩ	
R155	1-242-733	330kΩ	
R156	1-242-697	10kΩ	
R157	1-242-733	330kΩ	

PLAYBACK AMP CIRCUIT

SEMICONDUCTORS

Q201		transistor,	2SC631
Q202		transistor,	2SC631
Q203		transistor,	2SC634
Q204		transistor,	2SC634
Q205		transistor,	2SC634
Q206		transistor,	2SC634
D201		diode,	10D2
D202		diode,	1T22
D203		diode,	1T22
D204		diode,	10D2

COIL

L201	1-407-298	bias trap, 4.7 mH	

Ref. No.	Part No.		Description

TRANSFORMER

T201	1-427-284	headphone	

CAPACITORS

C201	1-121-410	47μF	25V	electrolytic
C202	1-127-304	3.3μF	16V	electrolytic
C203	1-105-661-12	0.001μF	50V	mylar
C204	1-121-413	100μF	6.3V	electrolytic
C205	1-121-403	33μF	16V	electrolytic
C206	1-121-398	10μF	25V	electrolytic
C207	1-121-416	100μF	25V	electrolytic
C208	1-105-677-12	0.022μF	50V	mylar
C209	1-107-244	470pF	50V	silvered mica
C210	1-121-391	1μF	50V	electrolytic
C211	1-105-661-12	0.001μF	50V	mylar
C212	1-121-409	47μF	16V	electrolytic
C213	1-107-125	56pF	50V	silvered mica
C214	1-121-416	100μF	25V	electrolytic
C215	1-121-409	47μF	16V	electrolytic
C216	1-121-398	10μF	25V	electrolytic
C217	1-121-391	1μF	50V	electrolytic
C218	1-121-398	10μF	25V	electrolytic
C219	1-121-398	10μF	25V	electrolytic
C220	1-121-395	4.7μF	25V	electrolytic
C221	1-121-391	1μF	50V	electrolytic
C222	1-121-410	47μF	25V	electrolytic
C223	1-105-661-12	0.001μF	50V	mylar

RESISTORS

All resistors are ¼W and carbon type, unless otherwise indicated.

R201	1-242-725	150kΩ
R202	1-242-739	560kΩ
R203	1-242-647	82Ω
R204	1-242-721	100kΩ
R205	1-242-704	20kΩ
R206	1-242-705	22kΩ
R207	1-242-692	6.2kΩ
R208	1-242-692	6.2kΩ
R209	1-242-697	10kΩ
R210	1-242-725	150kΩ
R211	1-242-705	22kΩ
R212	1-242-681	2.2kΩ
R213	1-242-685	3.3kΩ
R214	1-242-705	22kΩ
R215	1-242-729	220kΩ
R216	1-242-665	470Ω
R217	1-242-677	1.5kΩ
R218	1-242-709	33kΩ
R219	1-242-707	27kΩ
R220	1-242-663	390Ω
R221	1-242-677	1.5kΩ
R222	1-242-657	220Ω
R223	1-242-681	2.2kΩ
R224		– discarded –
R225	1-242-697	10kΩ
R226	1-242-721	100kΩ

Ref. No.	Part No.		Description
R227	1-242-721	100kΩ	
R228	1-242-737	470kΩ	
R229	1-242-681	2.2kΩ	
R230	1-221-311	5kΩ (B)	semi-fixed
R231	1-242-697	10kΩ	
R232	1-242-705	22kΩ	
R233	1-242-673	1kΩ	
R234	1-221-311	5kΩ (B)	semi-fixed
R235	1-242-701	15kΩ	
R236	1-242-657	220Ω	
R237	1-221-311	5kΩ (B)	semi-fixed
R238	1-242-697	10kΩ	
R239	1-242-609	2.2Ω	

BIAS OSC CIRCUIT

SEMICONDUCTORS

Q301	transistor,	2SC634
Q302	transistor,	2SC634
Q303	transistor,	2SC634
D301	diode,	10D2

COILS

L301	1-231-069	equalizer, 1.8 mH
L302	1-231-069	equalizer, 1.8 mH
L303	1-409-038	dummy, 1 mH
L304	1-409-038	dummy, 1 mH

MICRO INDUCTORS

L305	1-407-198	2.2 mH
L306	1-407-198	2.2 mH

TRANSFORMER

T301	1-433-145	bias osc.

CAPACITORS

C301	1-107-188	620 pF	500V	silvered mica
C302	1-107-188	620 pF	500V	silvered mica
C303	1-121-410	47μF	25V	electrolytic
C304	1-121-416	100μF	25V	electrolytic
C305	1-121-398	10μF	25V	electrolytic
C306	1-121-398	10μF	25V	electrolytic
C307	1-107-188	620 pF	500V	silvered mica
C308	1-107-188	620 pF	500V	silvered mica
C309	1-105-663-12	0.0015μF	50V	mylar
C310	1-109-507	4,700 pF	500V	dipped mica
C311	1-141-076	30 ~ 200 pF		trimmer
C312	1-141-076	30 ~ 200 pF		trimmer

RESISTORS

All resistors are ¼W and carbon type, unless otherwise indicated.

R301	1-242-649	100Ω
R302	1-242-681	2.2kΩ
R303	1-242-625	10Ω
R304	1-242-625	10Ω
R305	1-242-625	10Ω
R306	1-242-725	150kΩ
R307	1-242-725	150kΩ
R308	1-242-667	560Ω

RELAY

RY301	1-515-127	650Ω	24V

AMP CHASSIS CIRCUIT

RESISTORS

All resistors are ¼W and carbon type, unless otherwise indicated.

R402	1-242-684	3kΩ	
R403	1-242-684	3kΩ	
R404	1-242-691	5.6kΩ	
R405	1-242-691	5.6kΩ	
R406	1-242-697	10kΩ	
R407	1-242-697	10kΩ	
R410	1-242-721	100kΩ	
R411	1-242-721	100kΩ	
VR401 -1, -2	1-222-314	20kΩ (B)	variable (MIC-L) (MIC-R)
VR402 -1, -2	1-222-314	20kΩ (B)	variable (LINE-L) (LINE-R)
VR403 -1, -2	1-222-314	20kΩ (B)	variable (PB-L) (PB-R)
VR404 -1, -2	1-222-313	50kΩ (B)	variable (ECHO/SOS-L) (ECHO/SOS-R)

SWITCHES

S401	1-514-728	key, REC MODE
S403	1-514-692	lever, 2 position; MONITOR (L)
S404	1-514-692	lever, 2 position; MONITOR (R)
S405	1-513-347	slide, lead; TAPE SELECT

JACKS

CNJ401	1-507-142	phono, 2P; LINE INPUT (L)
CNJ402		phono, 2P; LINE INPUT (R)
CNJ403	1-507-282	binaural, HEADPHONE
CNJ404	1-507-281	MIC INPUT (L)
CNJ405	1-507-281	MIC INPUT (R)
CNJ406	1-509-029	connector, REC/PB
CNJ412, CNJ413	1-507-142	phono, 2P; LINE OUTPUT (L) / phono, 2P; LINE OUTPUT (R)

METERS

ME401	1-524-056	VU (L)
ME402	1-524-056	VU (R)

PILOT LAMPS

PL401	1-518-093-11	record(L), 100mA, 2V
PL402	1-518-093-11	record(R), 100mA, 2V

CONNECTORS

CNJ407 -411	1-507-300	printed circuit board, 22P (REC AMP, PB AMP & BIAS OSC)
CNP401	1-539-567-11	printed circuit board, 18P
CNP402	1-539-567-11	printed circuit board, 18P

NOTE: L = left channel R = right channel

Ref. No.	Part No.	Description		
TAPE SPEED SWITCH CIRCUIT				
		CAPACITORS		
C401	1-109-506	3,300 pF	500 V	dipped mica
C402	1-109-503	1,500 pF	500 V	dipped mica
		RESISTOR		
R401	1-242-673	1 kΩ	¼W	carbon
		SWITCH		
S402	1-514-693	lever, 3 position; TAPE SPEED		
RESISTOR TERMINAL CIRCUIT				
		RESISTORS		
R482	1-242-721	100 kΩ	¼W	carbon
R483	1-242-721	100 kΩ	¼W	carbon
ECHO/SOS SWITCH CIRCUIT				
		CAPACITORS		
C491	1-105-673-12	0.01 μF	50 V	mylar
C492	1-103-863	330 pF	50 V	polystyrol
C493	1-103-863	330 pF	50 V	polystyrol
C494	1-105-673-12	0.01 μF	50 V	mylar
		RESISTORS		
R491	1-242-715	56 kΩ	¼W	carbon
R492	1-242-715	56 kΩ	¼W	carbon
R493	1-242-699	12 kΩ	¼W	carbon
R494	1-242-715	56 kΩ	¼W	carbon
R495	1-242-715	56 kΩ	¼W	carbon
R496	1-242-699	12 kΩ	¼W	carbon
		SWITCH		
S406	1-514-693	lever, 3 position; ECHO/SOS		
SYSTEM CONTROL CIRCUIT				
		SEMICONDUCTORS		
Q601		transistor,	2SC634	
Q602		transistor,	2SC634	
Q603		transistor,	2SD28	
Q604		transistor,	2SC634	
Q605		transistor,	2SC634	
Q606		transistor,	2SD28	
Q607–611		transistor,	2SC634	
D601–632		diode,	10D2	
D633		diode,	1T22	
ZD601		diode, zener	1S334	
		CAPACITORS		
C601	1-121-810	470 μF	50 V	electrolytic
C602	1-121-810	470 μF	50 V	electrolytic
C603	1-121-417	100 μF	50 V	electrolytic
C604	1-121-733	470 μF	25 V	electrolytic
C605	1-121-388	1,000 μF	35 V	electrolytic
C606	1-121-422	220 μF	25 V	electrolytic
C607	1-121-422	220 μF	25 V	electrolytic
C608	1-121-422	220 μF	25 V	electrolytic
C609	1-121-422	220 μF	25 V	electrolytic
C610	1-105-689-12	0.22 μF	50 V	mylar
C611	1-121-410	47 μF	25 V	electrolytic
C612	1-121-420	220 μF	10 V	electrolytic
C613	1-121-422	220 μF	25 V	electrolytic
C614	1-105-689-12	0.22 μF	50 V	mylar
C615	1-105-689-12	0.22 μF	50 V	mylar
C616	1-105-689-12	0.22 μF	50 V	mylar
C617	1-105-687-12	0.15 μF	50 V	mylar
C618		– discarded –		
C619	1-105-685-12	0.1 μF	50 V	mylar
C620		– discarded –		
C621		– discarded –		
C622	1-121-480	22 μF	25 V	electrolytic
C623	1-121-392	3.3 μF	25 V	electrolytic
		RESISTORS		
		All resistors are ¼W and carbon type, unless otherwise indicated.		
R601	1-242-817	4.7 Ω		
R602	1-242-697	10 kΩ		
R603	1-242-665	470 Ω		
R604	1-242-677	1.5 kΩ		
R605	1-242-690	5.1 kΩ		
R606	1-242-685	3.3 kΩ		
R607	1-242-705	22 kΩ		
R608	1-242-657	220 Ω		
R609	1-242-581	2.2 kΩ		
R610	1-242-667	560 Ω		
R611	1-242-691	5.6 kΩ		
R612	1-242-705	22 kΩ		
R613	1-242-709	33 kΩ		
R614	1-242-685	3.3 kΩ		
R615	1-242-665	470 Ω		
R616	1-242-705	22 kΩ		
R617	1-242-673	1 kΩ		
R618	1-242-713	47 kΩ		
R619	1-242-713	47 kΩ		
R620		– discarded –		
R621	1-242-709	33 kΩ		
R622	1-242-705	22 kΩ		
R623	1-242-707	27 kΩ		
R624	1-242-709	33 kΩ		
R625	1-242-709	33 kΩ		
R626	1-242-709	33 kΩ		
R627	1-242-705	22 kΩ		
R628	1-242-697	10 kΩ		
R629	1-242-697	10 kΩ		
R630	1-242-705	22 kΩ		
R631	1-242-690	5.1 kΩ		
R632	1-242-697	10 kΩ		

Ref. No.	Part No.		Description
R633	1-242-673	1kΩ	
R634	1-242-675	1.2kΩ	
R635	1-242-701	15kΩ	
R636	1-242-705	22kΩ	
R637	1-242-677	1.5kΩ	
R638	1-242-703	18kΩ	
R639	1-242-705	22kΩ	
R640	1-242-677	1.5kΩ	
R641	1-242-703	18kΩ	
R642	1-242-705	22kΩ	
R643	1-207-273	5.1Ω	1.5W wire wound
R644	1-207-273	5.1Ω	1.5W wire wound
R645	1-207-273	5.1Ω	1.5W wire wound
R646	1-207-273	5.1Ω	1.5W wire wound
R647	1-242-675	1.2kΩ	
R648	1-242-705	22kΩ	
R649	1-242-705	22kΩ	

RELAY

RY601–604	1-515-127	650Ω	24V

APS & ATS CIRCUIT

SEMICONDUCTORS

Q701–712	transistor,	2SC634
D701	diode,	10D2
D702	diode,	1T22
D703	diode,	10D2
D704	diode,	10D2
D705	diode,	1T22
D706	diode,	10D2
D707	diode,	10D2
D708	diode,	1T22
D709	diode,	10D2
D710	diode,	10D2
D711	diode,	10D2
D712	diode,	10D2
ZD701	diode, zener	1S334

MICRO INDUCTOR

L701	1-407-212	33mH

CAPACITORS

C701	1-103-891	0.0047μF	50V	polystyrol
C702	1-103-891	0.0047μF	50V	polystyrol
C703	1-105-677-12	0.022μF	50V	mylar
C704	1-105-689-12	0.22μF	50V	mylar
C705	1-121-398	10μF	25V	electrolytic
C706		– discarded –		
C707		– discarded –		
C708	1-121-404	33μF	25V	electrolytic
C709	1-121-404	33μF	25V	electrolytic
C710	1-121-422	220μF	25V	electrolytic

Ref. No.	Part No.	Description

RESISTORS

All resistors are ¼W and carbon type, unless otherwise indicated.

R701	1-242-705	22kΩ
R702	1-242-683	2.7kΩ
R703	1-242-681	2.2kΩ
R704	1-244-680	2kΩ
R705	1-242-689	4.7kΩ
R706	1-242-709	33kΩ
R707	1-242-705	22kΩ
R708	1-242-697	10kΩ
R709	1-242-705	22kΩ
R710	1-242-709	33kΩ
R711	1-242-697	10kΩ
R712	1-242-709	33kΩ
R713	1-242-705	22kΩ
R714	1-242-625	10Ω
R715	1-242-691	5.6kΩ
R716	1-242-709	33kΩ
R717	1-242-701	15kΩ
R718	1-242-705	22kΩ
R719	1-242-705	22kΩ
R720	1-242-685	3.3kΩ
R721	1-242-667	560Ω
R722	1-242-697	10kΩ
R723	1-242-709	33kΩ
R724	1-242-709	33kΩ
R725	1-242-705	22kΩ
R726	1-242-709	33kΩ
R727	1-242-705	22kΩ
R728	1-242-705	22kΩ
R729	1-242-673	1kΩ
R730	1-242-697	10kΩ
R731	1-242-709	33kΩ
R732	1-242-705	22kΩ
R733	1-242-709	33kΩ
R734	1-242-673	1kΩ
R735	1-242-705	22kΩ
R736	1-242-705	22kΩ
R737	1-242-697	10kΩ
R738	1-242-709	33kΩ
R739	1-242-705	22kΩ

CAPSTAN SERVO CONTROL CIRCUIT

SEMICONDUCTORS

Q801–808	transistor,	2SC634
Q809	transistor,	2SA610
Q810	transistor,	2SC634
Q811	transistor,	2SC756
Q812–816	transistor,	2SC634
Q817	transistor,	2SC895
Q818	transistor,	2SC634
D801	diode,	10D2
D802	diode,	1T263

Ref. No.	Part No.		Description	
D803		diode,	1S334	
D804–811		diode,	10D2	
		CAPACITORS		
C801	1-105-661-12	0.001μF	50V	mylar
C802	1-105-671-12	0.0068μF	50V	mylar
C803	1-105-661-12	0.001μF	50V	mylar
C804	1-105-677-12	0.022μF	50V	mylar
C805	1-121-409	47μF	16V	electrolytic
C806	1-105-611-12	0.001μF	50V	mylar
C807	1-121-421	220μF	16V	electrolytic
C808	1-121-422	220μF	25V	electrolytic
C809	1-121-425	470μF	10V	electrolytic
C810	1-121-398	10μF	25V	electrolytic
C811	1-121-398	10μF	25V	electrolytic
C812	1-121-423	220μF	50V	electrolytic
C813	1-121-409	47μF	16V	electrolytic
C814	1-121-420	220μF	10V	electrolytic
C815	1-121-398	10μF	25V	electrolytic
C816	1-121-733	470μF	25V	electrolytic

RESISTORS

All resistors ¼W and carbon type, unless otherwise indicated.

R801	1-242-697	10kΩ		
R802	1-242-721	100kΩ		
R803	1-242-665	470Ω		
R804	1-242-665	470Ω		
R805	1-242-721	100kΩ		
R806	1-242-697	10kΩ		
R807	1-242-697	10kΩ		
R808	1-242-730	240kΩ		
R809	1-242-721	100kΩ		
R810	1-242-705	22kΩ		
R811	1-242-703	18kΩ		
R812	1-242-685	3.3kΩ		
R813	1-242-685	3.3kΩ		
R814	1-242-701	15kΩ		
R815	1-242-697	10kΩ		
R816		– discarded –		
R817	1-242-693	6.8kΩ		
R818	1-242-673	1kΩ		
R819	1-242-633	22Ω		
R820	1-242-673	1kΩ		
R821	1-242-669	680Ω		
R822	1-242-680	2kΩ		
R823	1-242-689	4.7kΩ		
R824	1-242-713	47kΩ		
R825	1-242-673	1kΩ		
R826	1-242-697	10kΩ		
R827	1-242-696	9.1kΩ		
R828	1-242-685	3.3kΩ		
R829	1-242-685	3.3kΩ		
R830	1-242-666	510Ω		
R831	1-242-701	15kΩ		
R832	1-242-681	2.2kΩ		
R833	1-242-701	15kΩ		
R834	1-207-268	3.3Ω	1.5W	wire wound
R835	1-242-721	100kΩ		
R836	1-242-717	68kΩ		
R837	1-242-697	10kΩ		
R838	1-242-681	2.2kΩ		
R839	1-206-093	1kΩ	1W	metal oxide film
R840	1-242-649	100Ω		
R841	1-242-653	150Ω		
R842	1-242-659	270Ω		
R843	1-242-699	12kΩ		
R844	1-242-681	2.2kΩ		
R845	1-242-703	18kΩ		
R846	1-242-689	4.7kΩ		
R847		– discarded –		
R848	1-242-710	36kΩ		
R849	1-242-673	1kΩ		
RA801	1-242-693	6.8kΩ		
RA802	1-242-693	6.8kΩ		
RA803	1-242-699	12kΩ		
VR801	1-221-175	20kΩ (B)	semi-fixed	
VR802	1-221-173	5kΩ (B)	semi-fixed	
VR803	1-221-172	2kΩ (B)	semi-fixed	
		RELAYS		
RY801	1-515-127	29.5mA	650Ω	
RY802	1-515-127	29.5mA	650Ω	

MECHA CHASSIS CIRCUIT

SEMICONDUCTORS

Q901–906	transistor,	2SD28
Q907	transistor,	2SC807A

TRANSFORMER

T901	1-441-629	power

CAPACITORS

C901	1-117-082	4μF	250V	metalized paper
C902	1-113-071	10μF	230V (block type)	metalized paper
C903	1-117-040	0.5+2μF	250V (block type)	metalized paper
C904	1-113-072	1μF	250V	metalized paper
C905	1-113-072	1μF	250V	metalized paper
C906	1-105-681-12	0.047μF	50V	mylar

RESISTORS

R901	1-205-511	500Ω	40H	wire wound
R902	1-205-502	100Ω	40H	wire wound
R903	1-205-503	68Ω	40H	wire wound
R904	1-205-503	68Ω	40H	wire wound
VR901	1-222-353	2kΩ, variable; SPEED TUNING		

SWITCHES

S901	1-514-734	seesaw; power
S902–907	1-514-057	micro; REW, STOP, PLAY, FF, REC, APS

Ref. No.	Part No.	Description
S908	1-514-692	lever, 2 position; TAPE SHIFT
S909	1-514-530	micro; shut-off
S910	1-514-735	toggle; reel selector
S911	1-514-324	slide; head selector
	SOLENOIDS	
PM901	1-454-059	tape shifter
PM902	1-454-060	brake
PM903	1-454-052	pinch roller
PM904	1-454-052	pinch roller
	PILOT LAMPS	
PL901–905	1-518-053-11	40 mA 28V (REW, FF, PLAY, REC, APS)
	ENCAPSULATED COMPONENTS C-R	
CP901	1-101-534	0.1+120Ω 500V
CP902–905	1-101-528	0.1+120Ω 250V
	CONNECTORS	
CNJ901	1-507-301	18P
CNJ902	1-507-301	18P
CNJ903	1-507-255	11P
CNJ904	1-508-399	6P
CNJ905	1-507-301	18P
CNJ906	1-509-062	POWER SUPPLY (General Export Model)
	1-509-445	POWER SUPPLY (GEP Model)
CNJ907	1-509-341	power outlet, UNSWITCHED
CNJ908	1-509-064	power voltage selector
CNP901	1-509-370	6P
CNP902	1-539-566-11	printed circuit board 18P; head
CNP903	1-506-180	11P; dummy plug
	MOTORS	
M901	8-836-624-06	capstan (UC-624G1)
M902	8-832-638-01	supply (IC-638R)
M903	8-832-638-01	take-up (IC-638R)

Ref. No.	Part No.	Description
	HEADS	
H901	8-821-228-24	play back (PP30-2802A) (2 track)
H902	8-829-142-20	play back (PP102-4202) (4 track)
H903	8-824-122-20	record (RP30-2202) (2 track)
	8-824-629-20	record (RP102-2902) (4 track)
H904	8-828-522-20	erase (EF85-2202) (2 track)
	8-826-629-25	erase (EF18-2902A1) (4 track)
H905	1-459-051-11	sensing
	HEAD ASSEMBLY	
H60-21S		for 2-track
H60-41S		for 4-track
	MISCELLANEOUS	
FB901	1-533-048	Holder, fuse
	1-536-213	Lug Plate, 5P
	1-508-411	Pin Terminal
	1-517-018	Socket, lamp; swan type

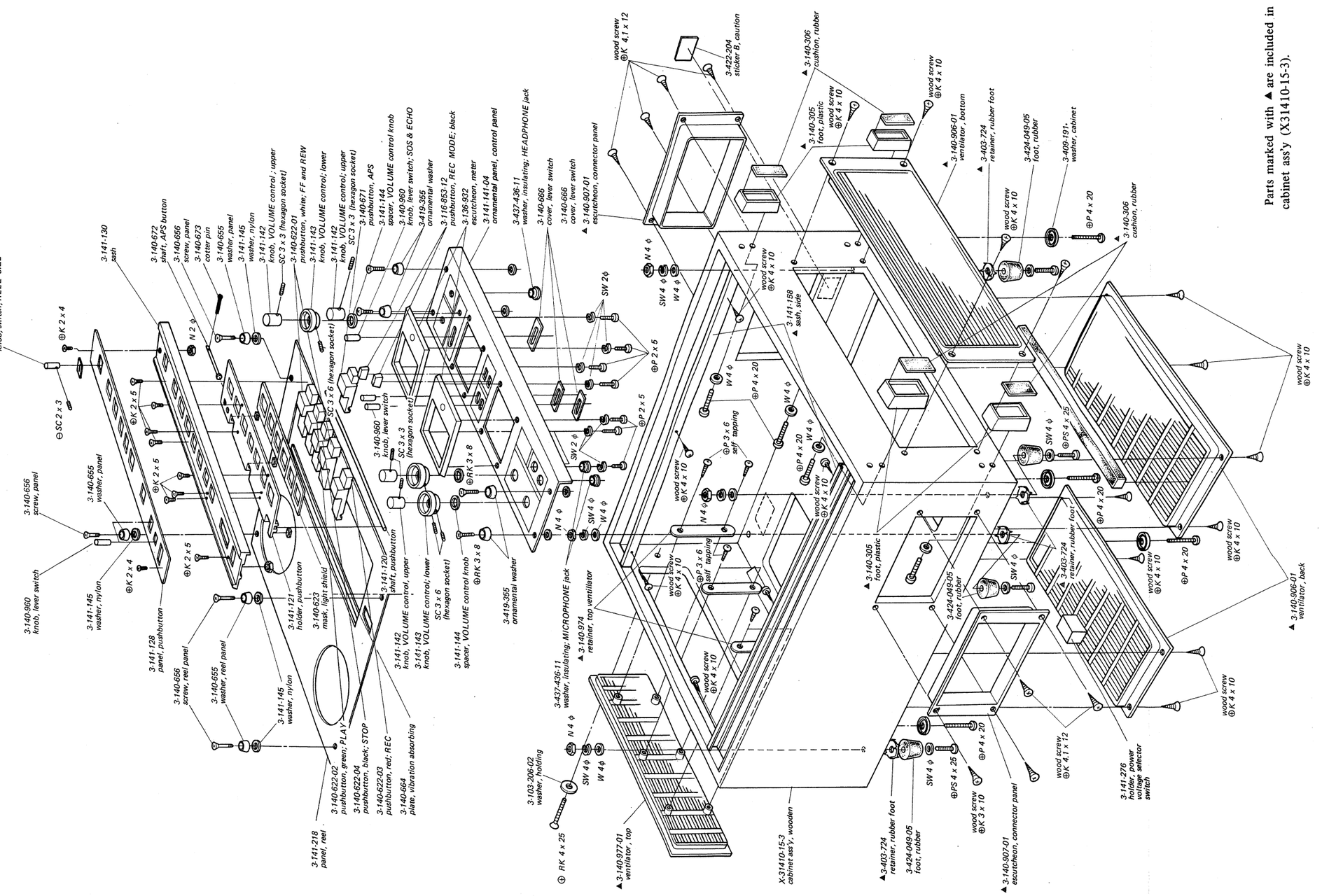
SHUT-OFF SWITCH CIRCUIT

	SEMICONDUCTORS			
Q991		transistor, 2SD28		
Q992		transistor, 2SC634		
	CAPACITOR			
C991	1-121-420	220μF	10V	electrolytic
	RESISTORS			
R991	1-206-097	2.2kΩ	1W	metal oxide film
R992	1-242-709	33kΩ	¼W	carbon
R993	1-242-691	5.6kΩ	¼W	carbon
R994	1-242-691	5.6kΩ	¼W	carbon
R995	1-242-713	47kΩ	¼W	carbon

When ordering replacement parts you should use PART NUMBER listed on the Parts List or shown in the Exploded View. The reference number should not be used for ordering purposes.

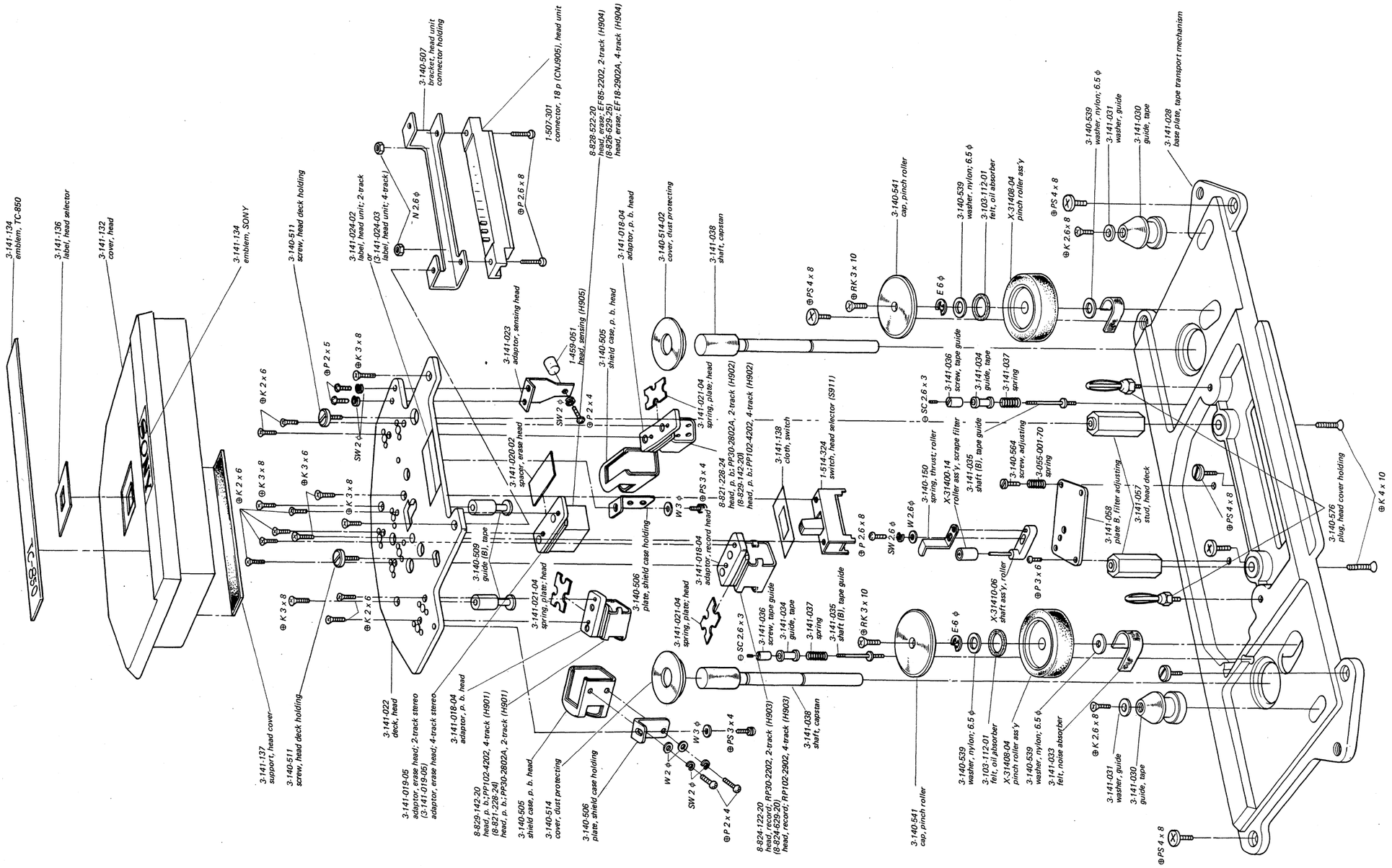
SECTION 8
EXPLODED VIEWS

8-1. CABINET — TOP VIEW —

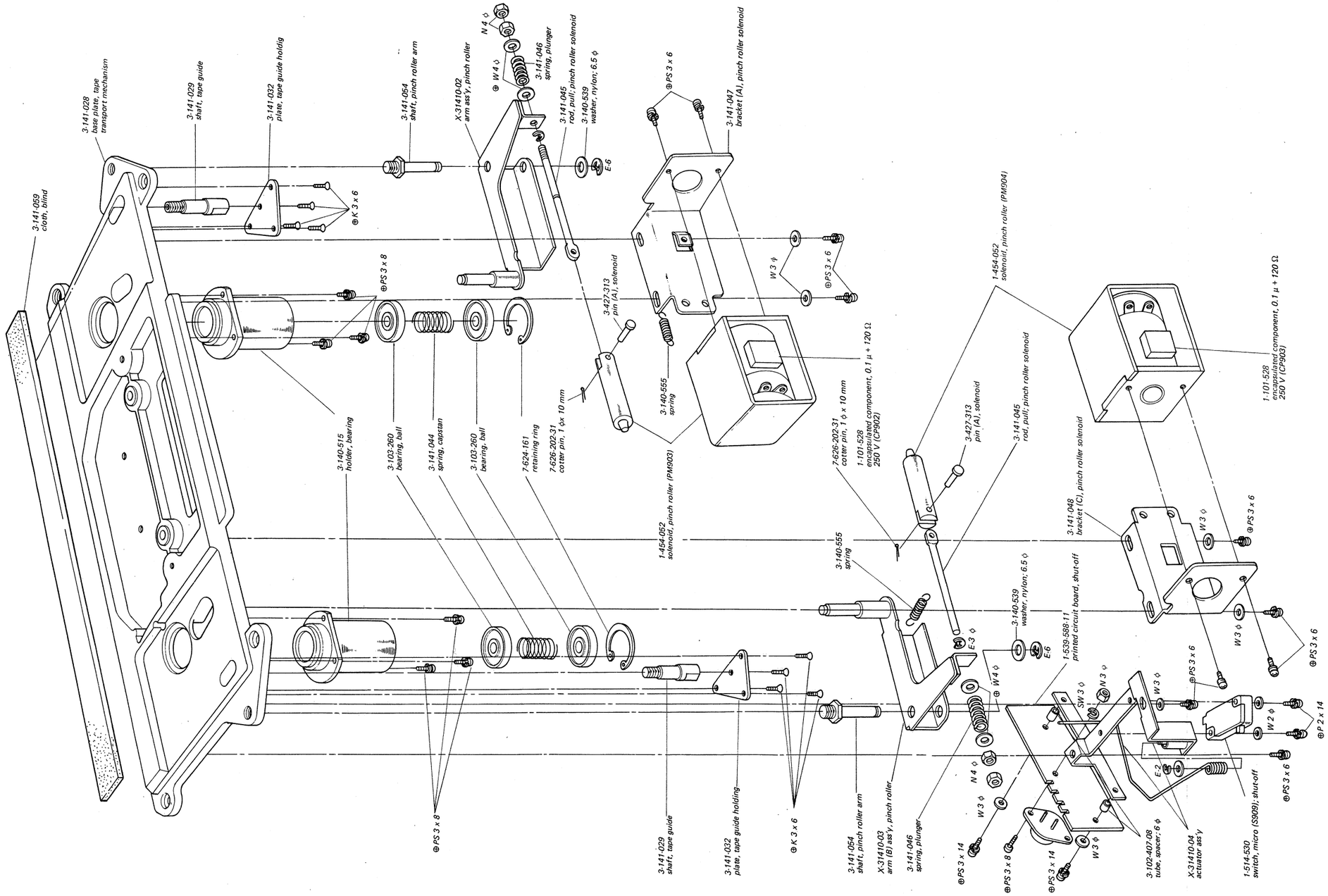

3-141-140 knob, switch, REEL SIZE
⊕K 2 x 4
⊖SC 2 x 3
3-140-656 screw, panel
3-140-960 knob, lever switch
3-141-130 sash
3-140-672 shaft, APS button
3-140-656 screw, panel
3-140-673 cotter pin
3-140-655 washer, panel
3-141-145 washer, nylon
3-141-142 knob, VOLUME control; upper
SC 3 x 3 (hexagon socket)
3-140-622-01 pushbutton, white; FF and REW
3-141-143 knob, VOLUME control; lower
3-141-142 knob, VOLUME control; upper
SC 3 x 3 (hexagon socket)
3-140-671 pushbutton, APS
3-141-144 spacer, VOLUME control knob
3-140-960 knob, lever switch; SOS & ECHO
3-419-355 ornamental washer
3-116-853-12 pushbutton, REC MODE; black
3-136-932 escutcheon, meter
3-141-141-04 ornamental panel, control panel
3-437-436-11 washer, insulating; HEADPHONE jack
3-140-666 cover, lever switch
3-140-666 cover, lever switch
3-140-907-01 escutcheon, connector panel
wood screw ⊕K 4.1 x 12
3-422-204 sticker B, caution
▲3-140-306 cushion, rubber
3-140-305 foot, plastic
wood screw ⊕K 4 x 10
wood screw ⊕K 4 x 10
3-140-906-01 ventilator, bottom
▲3-403-724 retainer, rubber foot
3-424-049-05 foot, rubber
3-409-191- washer, cabinet
⊕P 4 x 20
3-140-306 cushion, rubber
wood screw ⊕K 4 x 10
N 4 φ
SW 4 φ
W 4 φ
SW 2φ
⊕P 2 x 5
⊕P 4 x 20
W 4 φ
3-141-158 sash, side
⊕K 2 x 5
⊕K 2 x 4
N 2 φ
⊕K 2 x 5
⊕K 2 x 5
3-140-656 screw, panel
3-140-655 washer, panel
3-140-960 knob, lever switch
3-141-145 washer, nylon
⊕K 2 x 4
3-141-128 panel, pushbutton
⊕K 2 x 5
3-140-656 screw, reel panel
3-140-655 washer, reel panel
3-141-145 washer, nylon
3-141-121 holder, pushbutton
3-140-623 mask, light shield
3-141-120- shaft, pushbutton
3-141-142 knob, VOLUME control; upper
3-141-143 knob, VOLUME control; lower
SC 3 x 6 (hexagon socket)
3-141-144 spacer, VOLUME control knob
⊕RK 3 x 8
3-419-355 ornamental washer
3-141-218 panel, reel
3-140-622-02 pushbutton, green; PLAY
3-140-622-04 pushbutton, black; STOP
3-140-622-03 pushbutton, red; REC
3-140-664 plate, vibration absorbing
SC 3 x 6 (hexagon socket)
3-140-960 knob, lever switch
SC 3 x 3 (hexagon socket)
⊕P 2 x 5
SW 2 φ
N 4 φ
SW 4 φ
W 4 φ
3-437-436-11 washer, insulating; MICROPHONE jack
▲3-140-974 retainer, top ventilator
3-103-206-02 washer, holding
⊕RK 4 x 25
▲3-140-977-01 ventilator, top
X-31410-15-3 cabinet ass'y, wooden
wood screw ⊕K 4 x 10
⊕P 3 x 6 self tapping
⊕P 4 x 20
W 4 φ
wood screw ⊕K 4 x 10
N 4 φ
⊕P 3 x 6 self tapping
wood screw ⊕K 4 x 10
wood screw ⊕K 4 x 10
▲3-140-305 foot, plastic
3-424-049-05 foot, rubber
SW 4 φ
▲3-403-724 retainer, rubber foot
⊕P 4 x 20
wood screw ⊕K 4 x 10
⊕P 4 x 20
wood screw ⊕K 4 x 10
▲3-140-906-01 ventilator, back
wood screw ⊕K 4 x 10
SW 4 φ
⊕PS 4 x 25
⊕P 4 x 20
wood screw ⊕K 4 x 10
▲3-403-724 retainer, rubber foot
3-424-049-05 foot, rubber
SW 4 φ
⊕PS 4 x 25
⊕P 4 x 20
wood screw ⊕K 3 x 10
▲3-140-907-01 escutcheon, connector panel
wood screw ⊕K 4.1 x 12
3-141-276 holder, power voltage selector switch

Parts marked with ▲ are included in cabinet ass'y (X31410-15-3).

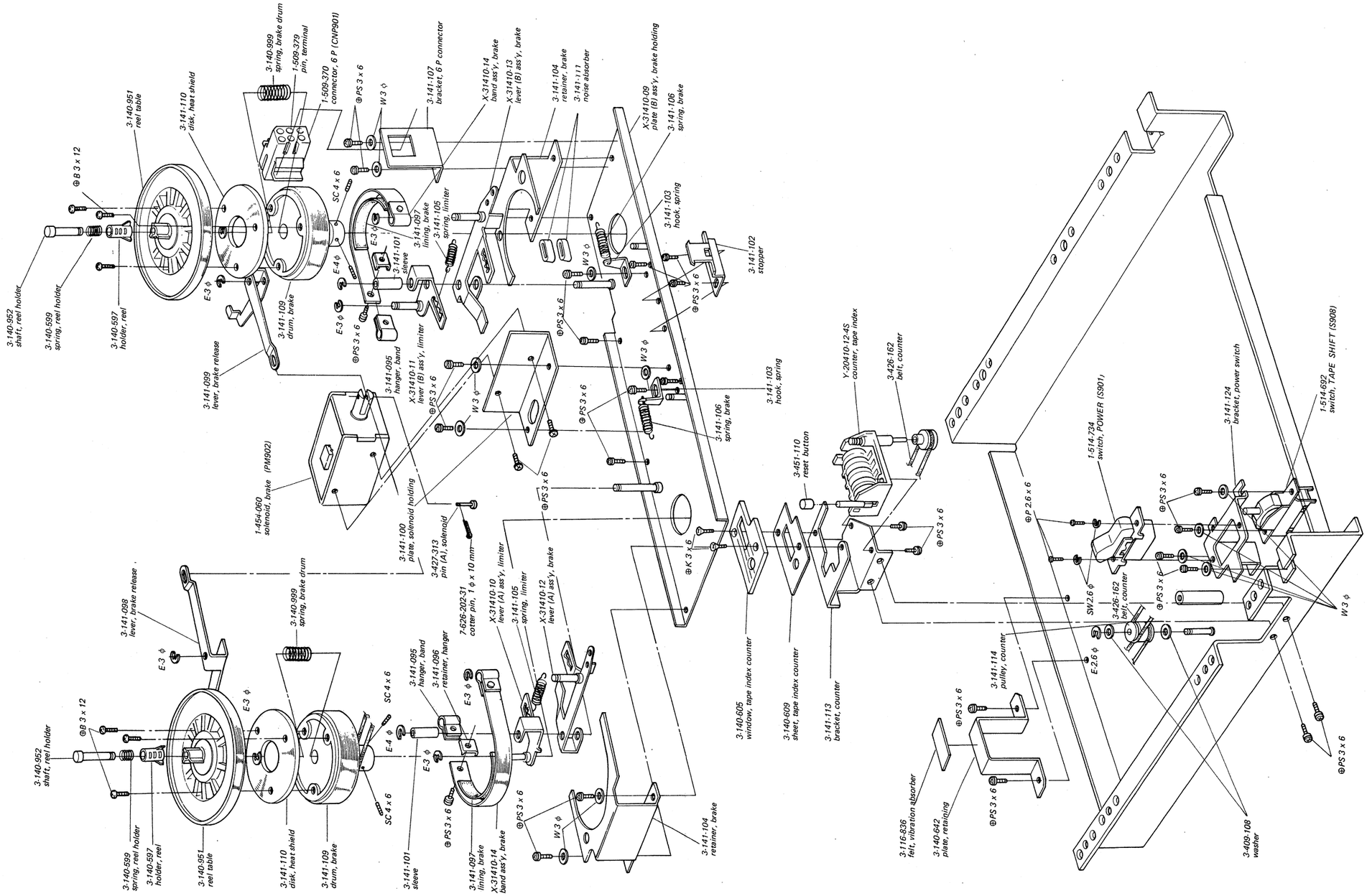
8-2. HEAD DECK – TOP VIEW –


3-141-134 emblem, TC-850
3-141-136 label, head selector
3-141-132 cover, head
3-141-134 emblem, SONY
3-140-511 screw, head deck holding
⊕P 2 x 5
⊕K 3 x 8
⊕K 2 x 6
⊕K 3 x 6
⊕K 3 x 8
⊕K 2 x 6
⊕K 3 x 8
⊕K 2 x 6
SW 2 φ
⊕P 2 x 4
3-141-024-02 label, head unit; 2-track
3-141-024-03 label, head unit; 4-track
N 2.6 φ
3-140-507 bracket, head unit connector holding
⊕P 2.6 x 8
1-507-301 connector, 18 p (CNJ905), head unit
8-828-522-20 head, erase; EF85-2202, 2-track (H904)
(8-826-629-25) head, erase; EF18-2902A, 4-track (H904)
3-141-023 adaptor, sensing head
1-459-051 head, sensing (H905)
3-140-505 shield case, p. b. head
3-141-018-04 adaptor, p. b. head
3-140-514-02 cover, dust protecting
3-141-038 shaft, capstan
⊕PS 4 x 8
⊕RK 3 x 10
3-140-541 cap, pinch roller
E 6 φ
3-140-539 washer, nylon; 6.5 φ
3-103-112-01 felt, oil absorber
X-31408-04 pinch roller ass'y
⊕PS 4 x 8
⊕K 2.6 x 8
3-140-539 washer, nylon; 6.5 φ
3-141-031 washer, guide
3-141-030 guide, tape
3-141-028 base plate, tape transport mechanism
3-141-137 support, head cover
3-140-511 screw, head deck holding
3-141-022 deck, head
3-141-019-05 adaptor, erase head; 2-track stereo (3-141-019-05)
adaptor, erase head; 4-track stereo
3-141-018-04 adaptor, p. b. head
8-829-142-20 head, p. b.; PP102-4202, 4-track (H901)
(8-821-228-24) head, p. b.; PP30-2802A, 2-track (H901)
3-140-505 shield case, p. b. head
3-140-514 cover, dust protecting
3-140-506 plate, shield case holding
W 3 φ
⊕PS 3 x 4
W 2 φ
SW 2 φ
⊕P 2 x 4
8-824-122-20 head, record; RP30-2202, 2-track (H903)
(8-824-629-20) head, record; RP102-2902, 4-track (H903)
3-141-038 shaft, capstan
3-141-021-04 spring, plate; head
3-140-509 guide (B), tape
3-141-020-02 spacer, erase head
3-140-506 plate, shield case holding
3-141-021-04 spring, plate; head
3-141-018-04 adaptor, record head
8-821-228-24 head, p. b.; PP30-2802A, 2-track (H902)
(8-829-142-20) head, p. b.; PP102-4202, 4-track (H902)
3-141-021-04 spring, plate; head
3-141-138 cloth, switch
1-514-324 switch, head selector (S911)
⊕P 2.6 x 8
SW 2.6 φ
W 2.6 φ
3-140-150 spring, thrust; roller
X-31400-14 roller ass'y, scrape filter
3-141-035 shaft (B), tape guide
⊕SC 2.6 x 3
3-141-036 screw, tape guide
3-141-034 guide, tape
3-141-037 spring
3-140-564 screw, adjusting
3-055-001-70 spring
⊕P 3 x 6
3-141-059 plate B, filter adjusting
3-141-057 stud, head deck
⊕PS 4 x 8
3-140-576 plug, head cover holding
⊕K 4 x 10
3-141-035 shaft (B), tape guide
3-141-037 spring
3-141-036 screw, tape guide
3-141-034 guide, tape
⊕RK 3 x 10
E-6 φ
X-31410-06 shaft ass'y, roller
⊕P 3 x 6
3-140-541 cap, pinch roller
3-140-539 washer, nylon; 6.5 φ
3-103-112-01 felt, oil absorber
X-31408-04 pinch roller ass'y
3-140-539 washer, nylon; 6.5 φ
3-141-033 felt, noise absorber
⊕K 2.6 x 8
3-141-031 washer, guide
3-141-030 guide, tape
⊕PS 4 x 8

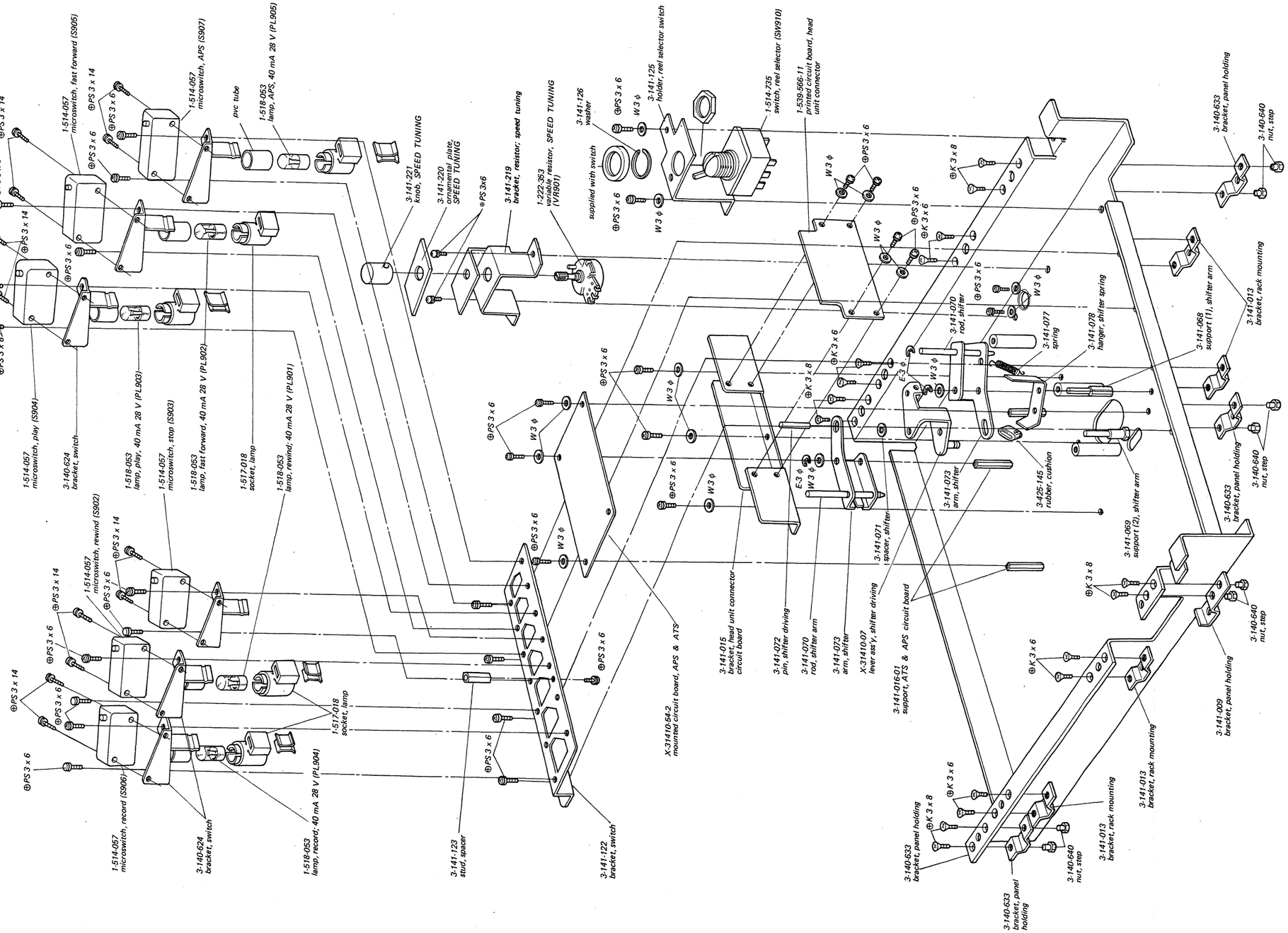
8-3. TAPE TRANSPORT MECHANISM VIEW


3-141-028 base plate, tape transport mechanism
3-141-029 shaft, tape guide
3-141-032 plate, tape guide holdig
3-141-054 shaft, pinch roller arm
X-31410-02 arm ass'y, pinch roller
N 4 ϕ
W 4 ϕ
3-141-046 spring, plunger
3-141-045 rod, pull; pinch roller solenoid
3-140-539 washer, nylon; 6.5 ϕ
E-6
3-141-047 bracket (A), pinch roller solenoid
⊕PS 3 x 6
3-141-059 cloth, blind
⊕K 3 x 6
⊕PS 3 x 8
3-427-313 pin (A), solenoid
W 3 ϕ
3-140-555 spring
1-454-052 solenoid, pinch roller (PM903)
7-626-202-31 cotter pin, 1 ϕx 10 mm
1-101-528 encapsulated component, 0.1 μ + 120 Ω 250 V (CP902)
3-140-615 holder, bearing
3-103-260 bearing, ball
3-141-044 spring, capstan
3-103-260 bearing, ball
7-624-161 retaining ring
7-626-202-31 cotter pin, 1 ϕx 10 mm
1-454-052 solenoid, pinch roller (PM904)
1-101-528 encapsulated component, 0.1 μ + 120 Ω 250 V (CP903)
3-141-048 bracket (C), pinch roller solenoid
E-3 ϕ
3-140-539 washer, nylon; 6.5 ϕ
E-6
1-539-588-11 printed circuit board, shut-off
SW 3 ϕ
N 3 ϕ
W 3 ϕ
⊕PS 3 x 6
W 2 ϕ
⊕P 2 x 14
E-2
⊕PS 3 x 8
3-141-029 shaft, tape guide
3-141-032 plate, tape guide holding
⊕K 3 x 6
3-141-054 shaft, pinch roller arm
X-31410-03 arm (B) ass'y, pinch roller
3-141-046 spring, plunger
N 4 ϕ
W 3 ϕ
⊕PS 3 x 14
⊕PS 3 x 8
⊕PS 2 x 14
3-102-407-08 tube, spacer; 6 ϕ
X-31410-04 actuator ass'y
1-514-530 switch, micro (S909); shut-off

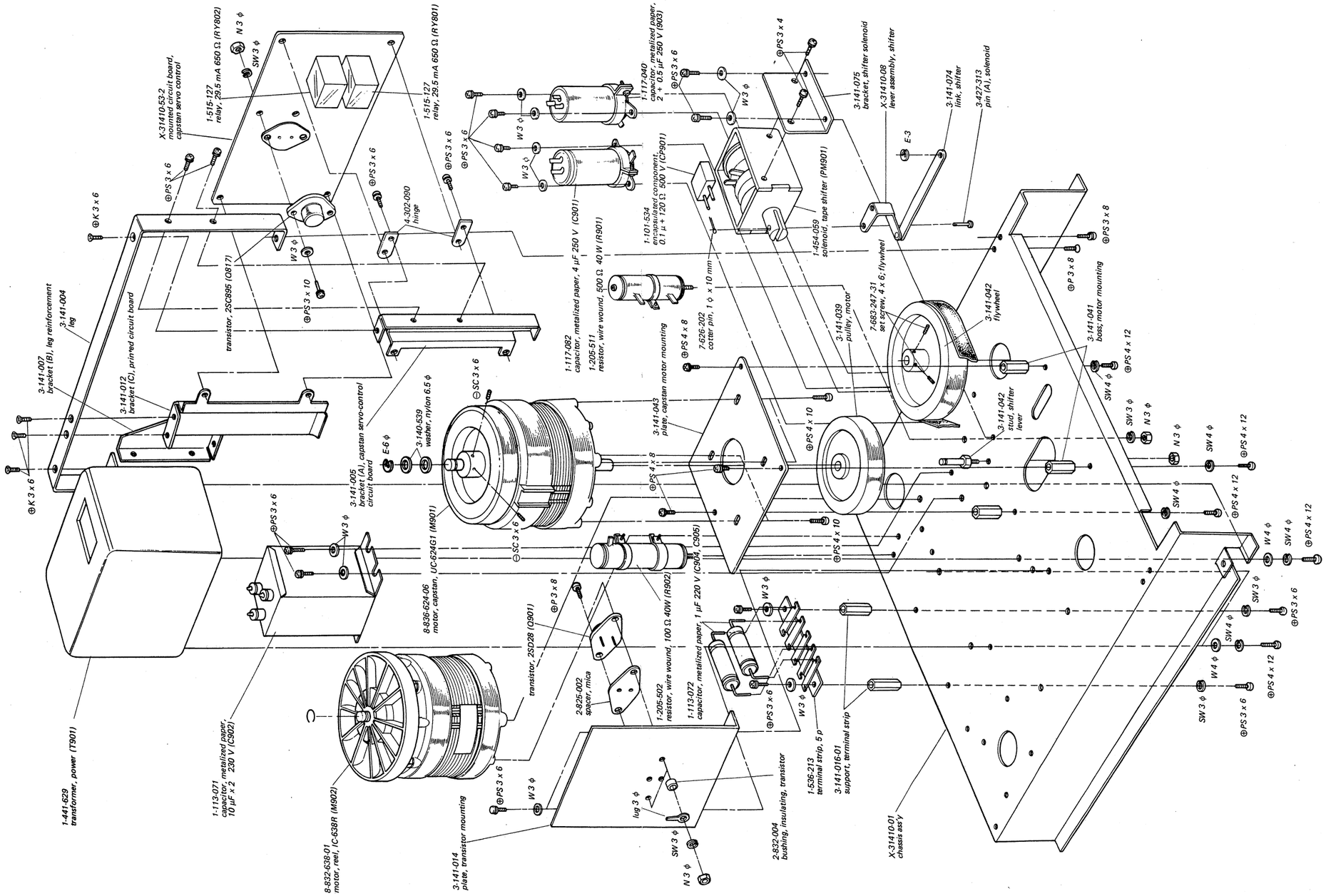
8-4. CHASSIS – TOP VIEW – (1)



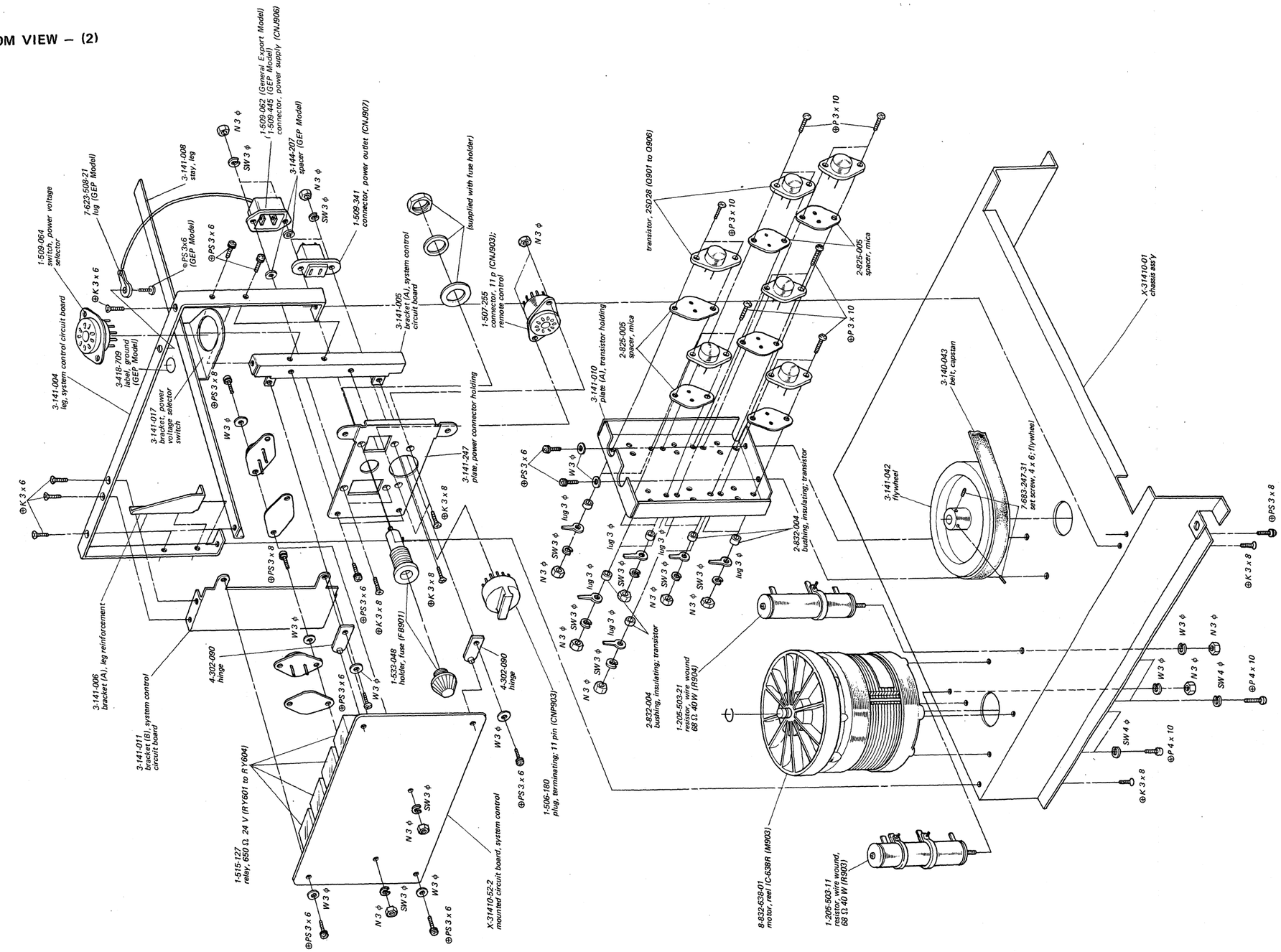
8-5. CHASSIS – TOP VIEW – (2)


⊕PS 3 x 14
⊕PS 3 x 6
1-514-057 microswitch, play (S904)
3-140-624 bracket, switch
1-514-057 microswitch, fast forward (S905)
1-514-057 microswitch, APS (S907)
pvc tube
1-518-053 lamp, APS, 40 mA 28 V (PL906)
3-141-221 knob, SPEED TUNING
3-141-220 ornamental plate, SPEED TUNING
⊕PS 3x6
3-141-219 bracket, resistor; speed tuning
1-222-353 variable resistor, SPEED TUNING (VR901)
3-141-126 washer
supplied with switch
W 3 ϕ
3-141-125 holder, reel selector switch
1-514-735 switch, reel selector (SW910)
1-539-566-11 printed circuit board, head unit connector
⊕K 3 x 8
⊕K 3 x 6
3-140-633 bracket, panel holding
3-140-640 nut, step
1-518-053 lamp, play, 40 mA 28 V (PL903)
1-514-057 microswitch, stop (S903)
1-518-053 lamp, fast forward, 40 mA 28 V (PL902)
1-517-018 socket, lamp
1-518-053 lamp, rewind; 40 mA 28 V (PL901)
3-141-070 rod, shifter
3-141-077 spring
3-141-078 hanger, shifter spring
3-141-068 support (1), shifter arm
3-141-013 bracket, rack mounting
E-3 ϕ
3-141-073 arm, shifter
3-425-145 rubber, cushion
3-141-069 support (2), shifter arm
1-514-057 microswitch, rewind (S902)
1-514-057 microswitch, record (S906)
3-140-624 bracket, switch
1-518-053 lamp, record; 40 mA 28 V (PL904)
3-141-123 stud, spacer
3-141-122 bracket, switch
X-31410-54-2 mounted circuit board, APS & ATS
3-141-016 bracket, head unit connector circuit board
3-141-072 pin, shifter driving
3-141-071 spacer, shifter
X-31410-07 lever ass'y, shifter driving
3-141-016-01 support, ATS & APS circuit board
3-140-633 bracket, panel holding
3-140-640 nut, step
3-141-009 bracket, panel holding
3-141-013 bracket, rack mounting
3-140-633 bracket, panel holding
3-140-640 nut, step

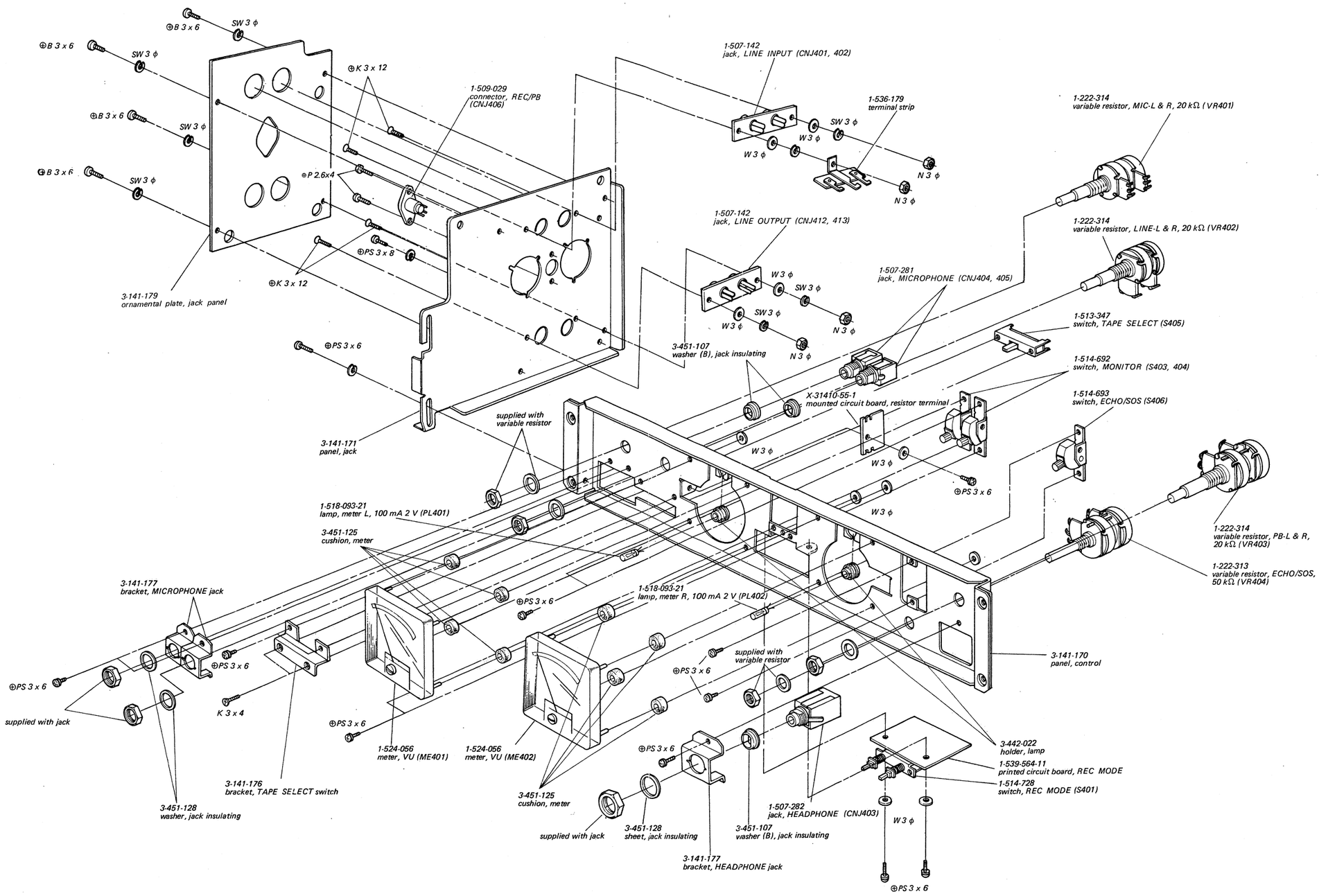
8-6. CHASSIS – BOTTOM VIEW – (1)


3.141-007 bracket (B), leg reinforcement
3.141-004 leg
3.141-012 bracket (C), printed circuit board
⊕K 3 x 6
⊕PS 3 x 6
X-31410-52-2 mounted circuit board, capstan servo control
1-515-127 relay, 29.5 mA 650 Ω (RY802)
N 3 φ
SW 3 φ
1-515-127 relay, 29.5 mA 650 Ω (RY801)
⊕PS 3 x 6
4-302-090 hinge
W 3 φ
⊕PS 3 x 10
transistor, 2SC895 (Q817)
⊕PS 3 x 6
⊕PS 3 x 6
W 3 φ
W 3 φ
1-117-040 capacitor, metalized paper, 2 + 0.1 μF 250 V (903)
⊕PS 3 x 6
W 3 φ
⊕PS 3 x 4
3-141-075 bracket, shifter solenoid
X-31410-08 lever assembly, shifter
E-3
3-141-074 link, shifter
3-427-313 pin (A), solenoid
1-117-082 capacitor, metalized paper, 4 μF 250 V (C901)
1-205-511 resistor, wire wound, 500 Ω 40 W (R901)
1-101-534 encapsulated component 0.1 μ + 120 Ω 500 V (CP901)
1-454-059 solenoid, tape shifter (PM901)
⊕PS 4 x 8
7-626-202 cotter pin, 1 φ x 10 mm
3-141-039 pulley, motor
7-683-247-31 set screw, 4 x 6; flywheel
3-141-042 flywheel
⊕P 3 x 8
⊕PS 3 x 8
3-141-041 boss; motor mounting
⊕PS 4 x 12
SW 4 φ
⊖SC 3 x 6
3-140-539 washer, nylon 6.5 φ
E-6 φ
3-141-005 bracket (A), capstan servo-control circuit board
3-141-043 plate, capstan motor mounting
⊕PS 4 x 8
⊕PS 4 x 10
3-141-042 stud, shifter lever
SW 3 φ
N 3 φ
N 3 φ
SW 4 φ
⊕PS 4 x 12
SW 4 φ
⊕PS 4 x 12
⊕PS 4 x 10
⊖SC 3 x 6
8-836-624-06 motor, capstan, UC-624G1 (M901)
1-205-502 resistor, wire wound, 100 Ω 40W (R902)
1-113-072 capacitor, metalized paper, 1 μF 220 V (C904, C905)
W 3 φ
W 4 φ
SW 4 φ
⊕PS 4 x 12
SW 3 φ
⊕PS 3 x 6
W 4 φ
SW 3 φ
SW 4 φ
⊕PS 4 x 12
⊕PS 3 x 6
⊕P 3 x 8
transistor, 2SD28 (Q901)
2-825-002 spacer, mica
⊕PS 3 x 6
W 3 φ
W 3 φ
1-536-213 terminal strip, 5 p
3-141-016-01 support, terminal strip
1-441-629 transformer, power (T901)
1-113-071 capacitor, metalized paper, 10 μF × 2 230 V (C902)
8-832-638-01 motor, reel, IC-638R (M902)
3-141-014 plate, transistor mounting
⊕PS 3 x 6
W 3 φ
lug 3 φ
SW 3 φ
N 3 φ
2-832-004 bushing, insulating, transistor
X-31410-01 chassis ass'y

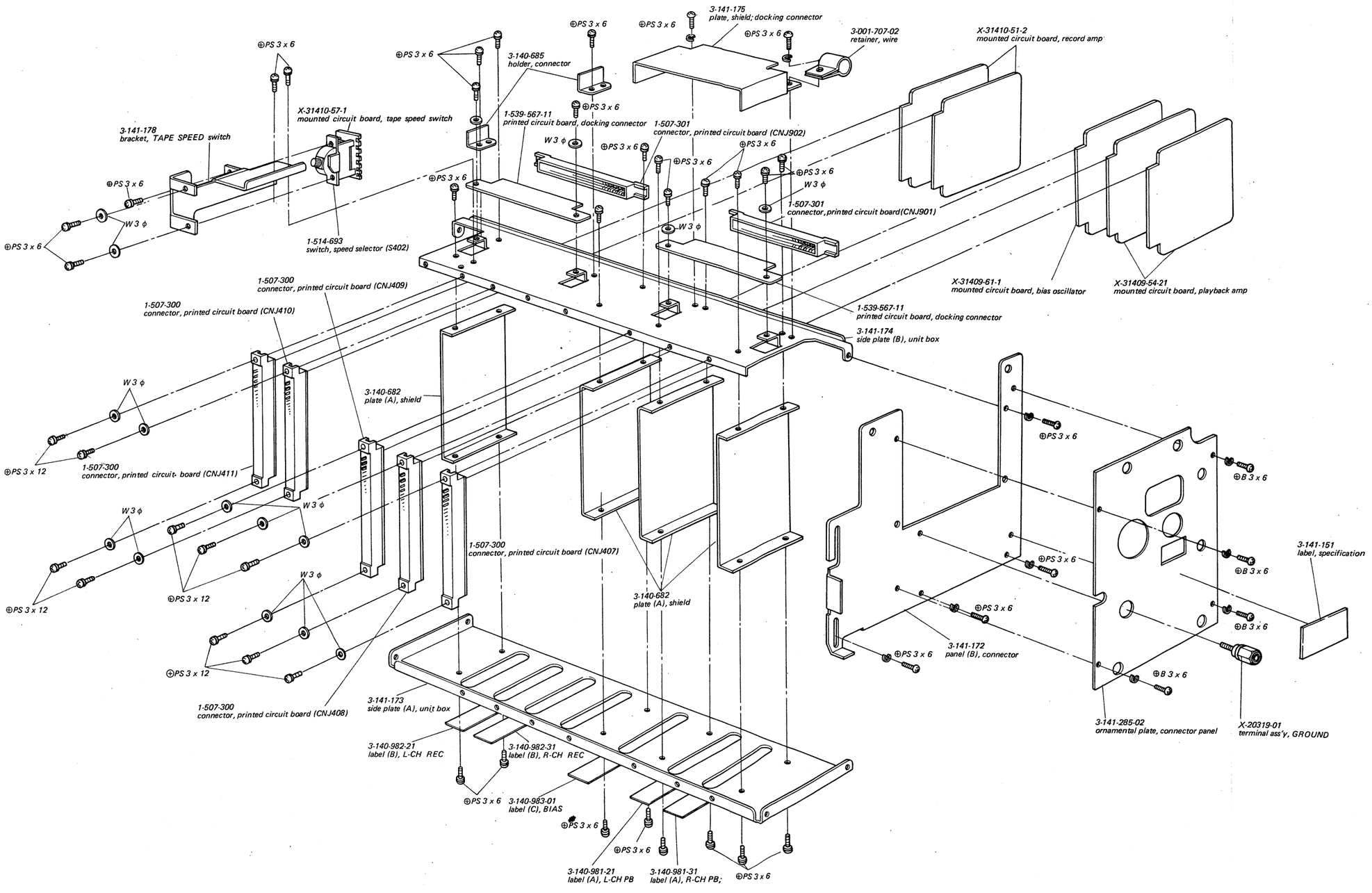
8-7. CHASSIS – BOTTOM VIEW – (2)


1-509-064 switch, power voltage selector
7-623-608-21 lug (GEP Model)
3-141-008 stay, leg
1-509-062 (General Export Model)
1-509-445 (GEP Model) connector, power supply (CNJ906)
3-144-207 spacer (GEP Model)
1-509-341 connector, power outlet (CNJ907)
⊕K 3 x 6
⊕PS 3x6 (GEP Model)
⊕PS 3 x 6
N 3 φ
SW 3 φ
3-141-004 leg, system control circuit board
3-418-709 label, ground (GEP Model)
3-141-017 bracket, power voltage selector switch
⊕PS 3 x 8
W 3 φ
3-141-005 bracket (A), system control circuit board
1-507-255 connector, 11 p (CNJ903); remote control
(supplied with fuse holder)
3-141-247 plate, power connector holding
⊕K 3 x 8
transistor, 2SD28 (Q901 to Q906)
⊕P 3 x 10
2-825-005 spacer, mica
3-141-010 plate (A), transistor holding
2-832-004 bushing, insulating; transistor
lug 3 φ
X-31410-01 chassis ass'y
3-140-043 belt, captan
3-141-042 flywheel
4-683-247-31 set screw, 4 x 6; flywheel
⊕P 4 x 10
⊕K 3 x 6
3-141-006 bracket (A), leg reinforcement
3-141-011 bracket (B), system control circuit board
4-302-090 hinge
1-533-048 holder, fuse (F8901)
1-615-127 relay, 650 Ω 24 V (RY601 to RY604)
X-31410-52-2 mounted circuit board, system control
1-506-180 plug, terminating; 11 pin (CNP903)
2-832-004 bushing, insulating; transistor
1-205-503-21 resistor, wire wound 68 Ω 40 W (R904)
8-832-638-01 motor, reel IC-638R (M903)
1-205-503-11 resistor, wire wound, 68 Ω 40 W (R903)

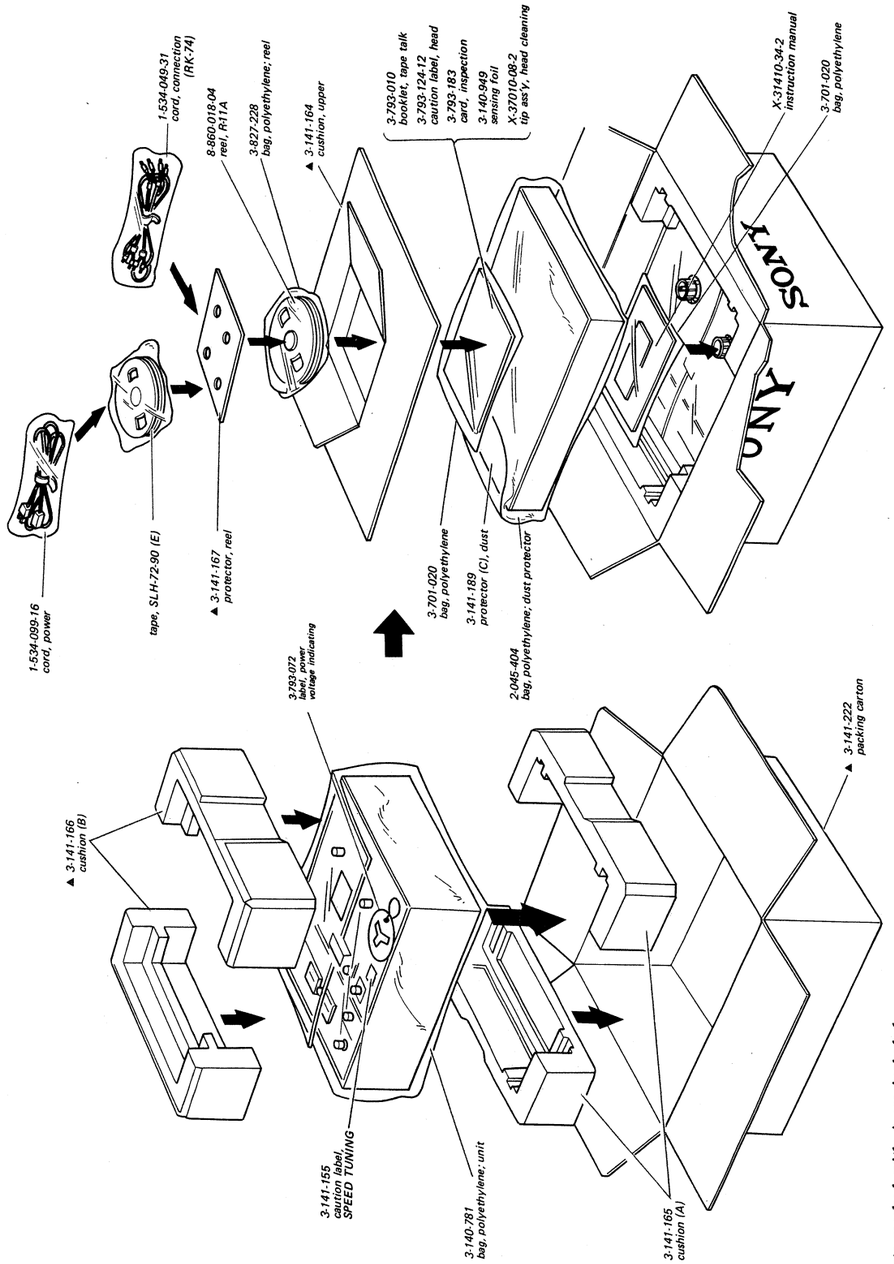
8-8. CONTROL PANEL VIEW



8-9. AUDIO AMP CIRCUIT BOARD VIEW



8-10. PACKING



Parts marked with ▲ are included in carton ass'y (X-31410-23).

SECTION 9
HARDWARES

Part No.	Description
	SCREWS
0-503-222-00	⊕ P 3 x 8
7-621-255-24	⊕ P 2 x 4
7-621-255-34	⊕ P 2 x 5
7-621-255-44	⊕ P 2 x 6
7-621-255-54	⊕ P 2 x 8
7-621-255-74	⊕ P 2 x 12
7-621-259-44	⊕ P 2.6 x 6
7-621-259-64	⊕ P 2.6 x 10
7-621-555-34	⊕ K 2 x 5
7-621-555-44	⊕ K 2 x 6
7-621-559-24	⊕ K 2.6 x 4
7-621-559-44	⊕ K 2.6 x 6
7-621-712-22	⊖ SC 2.6 x 3
7-621-770-34	⊕ B 2 x 5
7-681-259-54	⊕ P 2.6 x 8
7-682-146-02	⊕ P 3 x 5
7-682-147-02	⊕ P 3 x 6
7-682-147-15	⊕ P 3 x 6
7-682-150-02	⊕ P 3 x 12
7-682-166-02	⊕ P 4 x 20
7-682-247-02	⊕ K 3 x 6
7-682-248-02	⊕ K 3 x 8
7-682-348-14	⊕ RK 3 x 8
7-682-367-14	⊕ RK 4 x 25
7-682-547-15	⊕ B 3 x 6
7-682-548-15	⊕ B 3 x 8
7-682-647-02	⊕ PS 3 x 6
7-682-648-02	⊕ PS 3 x 8
7-682-649-02	⊕ PS 3 x 10
7-682-651-02	⊕ PS 3 x 14
7-682-661-02	⊕ PS 4 x 8
7-682-662-02	⊕ PS 4 x 10

Part No.	Description
7-683-237-31	3 x 3, lock w/hexagon socket
7-683-238-01	3 x 4, lock w/hexagon socket
7-683-240-31	3 x 6, lock w/hexagon socket
7-683-247-31	4 x 6, lock w/hexagon socket
	2 x 4, lock w/hexagon socket
	NUTS
7-622-107-04	2.6φ
7-684-013-02	3φ
7-684-014-02	4φ
	WASHERS
7-623-105-14	2φ (middle)
7-623-107-14	2.6φ (middle)
7-623-108-14	3φ (middle)
7-623-110-14	4φ (middle)
7-623-205-21	2φ, spring
7-623-207-21	2.6φ, spring
7-623-208-21	3φ, spring
7-623-210-21	4φ, spring
	RETAINING RINGS
7-624-104-01	E-2
7-624-105-01	E-2.3
7-624-106-01	E-3
7-624-108-01	E-4
7-624-109-01	E-5
7-624-161-00	R type
	LUG PLATES
7-623-508-01	3φ
7-626-202-31	1φ x 10

Hardware Nomenclature

P – Pan Head Screw .....
PS – Pan Head Screw with Spring Washer .....
K – Flat Countersunk Head Screw ...
B – Binding Head Screw .....
RK – Oval Countersunk Head Screw ..
T – Truss Head Screw .....
R – Round Head Screw .....
F – Flat Fillister Head Screw .....

SC – Set Screw .....
E – Retaining Ring (E Washer) .....
W – Washer
SW – Spring Washer
LW – Lock Washer
N – Nut

– Example –